UNIVERSITÉ DE SHERBROOKE

ÉCOLE DE GESTION

Essais sur les conséquences des chocs de revenus tirés des ressources naturelles : le cas des finances publiques et de l'économie politique

par

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Cette thèse a été évaluée par un jury composé par les personnes suivantes :

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P[r] Martino Pelli	Directeur de thèse
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P[r] Patrick Richard	Examinateur interne
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Avant-propos

Cette thèse a été rédigée au cours de mes études de doctorat à l'Université de Sherbrooke. Elle comprend trois chapitres qui sont des articles. À l'exception du deuxième article, je suis seul auteur. Mon co-directeur de thèse, le P^{r} Marcelin Joanis est mon coauteur en ce qui concerne ce deuxième article. L'idée originale pour cet article provient de mon mémoire de Maîtrise. La version présentée dans cette thèse, quoique utilisant cette idée a bénéficié de plusieurs échanges avec mon coauteur et co-directeur de thèse. Nous avons combiné nos expertises respectives sur la question des règles budgétaires. Le P^{r} Joanis a travaillé sur la question des règles budgétaires principalement dans le contexte nord-américain alors que mes travaux portent essentiellement sur les pays en développement et les questions liées aux ressources naturelles. Le travail de collecte de données, d'analyse empirique et d'écriture a été réalisé par moi-même pour cette thèse. Enfin, ce chapitre est inclus dans la thèse avec l'autorisation de mon coauteur.

Sommaire

Les pays riches en ressources naturelles ne sont pas nécessairement les plus prospères. Le fait que la richesse en ressources naturelles puisse conduire à l'appauvrissement est connu sous le nom de « malédiction des ressources naturelles ». Ce constat continue d'être l'objet de plusieurs discussions et recherches scientifiques en économie. Cette thèse s'inscrit dans ce champ de recherche.

Notre thèse poursuit deux grands objectifs. Le premier consiste à explorer la manifestation de la « malédiction des ressources naturelles » dans le contexte des finances publiques. Quant au deuxième objectif, il s'agit de proposer un nouveau mécanisme et donc une nouvelle explication de la « malédiction des ressources naturelles ». Par ailleurs, la méthodologie utilisée dans cette thèse combine une approche empirique (utilisation des données) avec une modélisation théorique.

En ce qui concerne le premier objectif, celui d'explorer la manifestation du phénomène en matière des finances publiques, deux composantes sont considérées : la politique fiscale d'une part et les dépenses publiques d'autre part. Dans la poursuite de cet objectif, nous examinons aussi le rôle potentiel de certaines politiques pour atténuer le phénomème observé. Ainsi, quant aux politiques fiscales, les principaux résultats se résument comme suit : les chocs positifs de revenus tirés des ressources naturelles tendent à réduire l'effort de collecte des recettes fiscales. Toutefois, cette constatation nommée la « malédiction des revenus » est atténuée par une fiscalité progressive. Ensuite, en ce qui concerne les dépenses publiques, la richesse en ressources naturelles tend à exacerber le comportement d'accroissement des dépenses publiques en période électorale. Par ailleurs, alors que des institutions budgétaires visant à limiter les excès en matière budgétaire sont efficaces pour limiter ces dépenses en général, il ne semble pas qu'elles puissent l'être dans le contexte de pays riches en ressources naturelles.

En poursuivant le deuxième objectif, celui consistant à proposer une nouvelle perspective sur les causes profondes de la « malédiction des ressources naturelles », nous utilisons une approche d'économie politique. Notre thèse s'appuie ainsi sur les travaux de recherche établissant que le niveau d'éducation des leaders nationaux est un déterminant important des performances économiques. Notre hypothèse de recherche est la suivante : si les leaders nationaux éduqués tendent à influencer positivement la croissance économique, alors les booms de ressources naturelles auraient tendance à induire une mauvaise performance économique, si elles favorisent l'arrivée au pouvoir de leaders moins éduqués. La méthodologie employée combine une analyse empirique avec une modélisation théorique. Les principaux résultats démontrent qu'en effet, les chocs positifs de prix des ressources naturelles tendent à réduire de manière significative la probabilité de sélectionner un leader national ayant un niveau d'éducation universitaire. Toutefois, une exploration approfondie montre que le résultat ne tient que dans les pays en développement avec une forte fragmentation ethnique (avec une grande diversité ethnique). Un modèle théorique permet d'expliquer ce résultat par un jeu d'interactions entre les groupes ethniques et les candidats aux élections qui résulte en une désincitation des citoyens avec un haut niveau d'éducation à se porter candidats.

En somme, la « malédiction des ressources naturelles » peut se manifester aussi soit par un faible effort fiscal ou par des dépenses publiques importantes en période électorale. Cependant, cette manifestation en matière de recettes fiscales n'est pas une fatalité car notamment les pays qui mettent en place une fiscalité progressive arrivent à atténuer la malédiction des revenus. Par ailleurs, la faible capacité à lever des recettes fiscales ainsi que la mauvaise allocation des ressources publiques, notamment les dépenses publiques en période électorale, pourraient être le reflet d'une compétence limitée des leaders nationaux. En effet, les pays en développement qui sont riches en ressources naturelles, en particulier ceux caractérisés par une forte fragmentation ethnique, tendent à sélectionner des leaders peu compétents pour faire les choix des politiques publiques.

Résumé et mots-clés

Notre thèse analyse les conséquences de l'accumulation des rentes tirées des ressources naturelles dans les pays en développement avec un accent particulier sur les finances publiques et l'économie politique. En premier lieu, deux aspects des finances publiques (les recettes fiscales et les dépenses publiques) sont étudiés. Enfin, en ce qui concerne l'angle de l'économie politique, l'analyse porte sur l'influence de ces rentes sur la sélection des leaders politiques nationaux.

Le chapitre 1 s'intéresse à une analyse de l'effet causal des rentes tirées des ressources naturelles sur l'effort de collecte des recettes fiscales. La méthodologie utilisée combine une approche théorique avec celle empirique. La dépendance en ressources naturelles constitue un obstacle majeur à la viabilité des revenus publics, surtout dans les pays en développement. Des travaux précédents ont montré que dans les pays qui sont riches en ressources naturelles, les gouvernements ont souvent très peu d'incitation à développer et à maintenir des systèmes de taxation efficients. Dans ce chapitre, nous considérons un cadre théorique dans lequel, le gouvernement d'un pays riche en ressources naturelles doit prendre la décision d'investir dans sa propre capacité à lever des taxes. Au sein de ce cadre théorique, nous évaluons le rôle de la progressivité du système de taxation. Ce modèle théorique prédit qu'un pays avec un système de taxation progressif est incité à investir dans sa capacité à lever des recettes fiscales. En effet, la progressivité du système de taxation donne l'opportunité au gouvernement de lever plus de recettes fiscales (en particulier sur les hauts revenus). Cette prédiction est ensuite testée sur un échantillon de 57 pays en développement sur la période 1981-2005. Après avoir traité le problème d'endogénéité par le biais de la technique de variable instrumentale s'appuyant sur l'usage du taux de croissance des prix des ressources naturelles spécifiques aux pays, les résultats principaux sont les suivants. Une augmentation d' 1 $ des rentes accumulées en ressources naturelles conduisent à une réduction des recettes fiscales de 0,25 $. Cependant, un niveau de progressivité équivalent au double de la moyenne de l'échantillon atténue de presque moitié

cet effet négatif. Ces résultats suggèrent que des réformes fiscales axées sur la progressivité du système de taxation pourraient aider les pays en développement qui sont riches en ressources naturelles à améliorer leur capacité à lever des recettes fiscales.

Le chapitre 2 examine les cycles électoraux en dépenses publiques dans les pays en développement (PED) avec un accent sur le rôle des institutions budgétaires telles que les règles budgétaires (des « contraintes permanentes sur la politique budgétaire en termes d'indicateurs de performance »). Plusieurs pays en développement ont adopté ces règles budgétaires. Toutefois, la faible capacité institutionnelle de ces pays donne lieu à des doutes sur l'efficacité de ces règles budgétaires. Ce chapitre estime l'impact causal des règles budgétaires sur les cycles électoraux dans un échantillon de 67 pays en développement sur la période 1985-2007. Nous exploitons la proximité géographique des pays (nombre de pays voisins qui ont adopté ces règles) pour concevoir une stratégie d'identification et prédire la probabilité d'adoption au niveau des pays. Nos résultats montrent que les règles budgétaires réduisent les dépenses publiques en période électorale de 1,65 point de pourcentage du PIB. Par ailleurs, l'efficacité des règles dépend de leurs caractétistiques institutionnelles, leur type, leur longévité et le degré de compétitivité des élections. Ces résultats sont robustes à l'utilisation d'une seconde approche qui nous permet d'utiliser un autre instrument et donc de tester le degré de suridentification. De plus, nous avons trouvé que ces cycles électoraux sont particulièrement renforcés dans les pays riches en ressources naturelles. Cependant, nous n'avons pas trouvé de résultat solide en ce qui concerne le rôle des règles budgétaires en matière de cycles électoraux dans les pays riches en ressources naturelles.

Le chapitre 3 analyse l'effet des chocs des prix de pétrole en période électorale sur le niveau d'éducation des leaders nationaux en exploitant des données originales sur plus de 700 leaders nationaux provenant de 111 pays sur trois quarts de siècle. Les résultats montrent que les chocs positifs de prix de pétrole réduisent considérablement la probabilité (jusqu'à une réduction de 21 %) de sélectionner un

leader national avec un niveau d'éducation élevé. Dans ce chapitre, ce résultat est nommé « malédiction de leadership ». L'exploration des mécanismes sous-jacents a démontré plusieurs choses. Ce résultat est particulièrement prononcé dans les pays disposant d'un régime présidentiel, d'un système de vote proportionnel et semble provenir essentiellement des PED à forte fragmentation ethnique. Enfin, ce chapitre propose un cadre théorique pour expliquer davantage ce dernier canal. Dans ce modèle, un potentiel candidat à la tête du pays interagit avec une coalition de chefs des différents groupes ethniques dans le pays. Cette coalition offre le soutien électoral au candidat en échange de faveurs lorsque ce dernier aura pris fonction. De plus, la coalition spécifie une menace de révolution ou de coup d'État afin de contraindre le nouveau leader ainsi élu à respecter sa part du marché. Par ailleurs, un choc positif de prix, en augmentant la valeur des rentes de ressources naturelles, rend cette menace (similaire à une taxe sur les bénéfices du pouvoir) crédible. Cette situation décourage la candidature des citoyens avec un niveau d'éducation élevé, qui préfèrent rester dans le secteur privé. Ces résultats suggèrent que les ressources naturelles peuvent entraver le développement économique en amenuisant les chances de sélectionner des leaders a priori compétents pour faire les meilleurs choix de politiques publiques.

Mots-clés : capacité fiscale, choc des prix du pétrole, cycles politico-budgétaires, discipline budgétaire, élection, fiscalité progressive, leadership national, malédiction des ressources naturelles, malédiction des revenus, malédiction du leadership, pays en développement, sélection politique.

Abstract and keywords

This thesis investigates the consequences of windfall revenues in developing countries with a specific focus on the linkages with public finance and political economy. First, I consider two different but closely related aspects of public finance which are taxation and public spending. Regarding the political economy side, I analyze how resource windfall shocks can affect political selection.

Chapter 1 investigates the causal effect of natural resource rent windfalls on tax revenue collection effort in developing countries both with theory and data. The dependency on natural resources is an obstacle to the sustainability of government revenues especially in developing countries. This paper firstly investigates whether resource windfall shocks cause less tax effort in developing countries. Second, it explores the potential mitigating role of the progressivity of the tax system. In this regard, a dynamic framework predicts that a resource-rich country with a progressive income tax has more incentives to invest in its ability to raise tax revenues. The intuition is that the progressive tax system allows the government to collect more taxes (especially on high incomes). My empirical analysis covers a sample of 57 developing countries over the period 1981-2005. I tackle the endogeneity of natural resources rents by using an instrumental variable approach. I construct a country-specific natural resource price index and exploit its growth rate as an instrument. The results show that an increase in resource rent windfalls of $1 leads to a reduction in domestic tax revenues by $0.25. My point estimate is remarkably close to the estimate found in a previous work based on the United States. Yet, at a level of progressivity equivalent to twice the sample average, an increase in resource rent windfalls of $1 reduces domestic tax revenues by only $0.14. These findings suggest that income tax reforms toward progressivity may help resource-rich developing countries enhance their fiscal capacity.

Chapter 2 examines the effect of elections on public spending behavior in developing countries with an evaluation of the causal effects of particular fiscal institutions

which are fiscal rules ("permanent constraint on fiscal policy in terms of a summary indicator of fiscal performance"). Many developing countries have adopted fiscal rules but the weak enforcement capacity of these countries may cast a doubt on the ability of these rules to improve fiscal discipline. This chapter estimates the causal effect of fiscal rules on political budget cycles in a sample of 67 developing countries over the period 1985-2007. We exploit the geographical pattern in the adoption of fiscal rules to isolate an exogenous source of variation in the adoption of national fiscal rules. Based on a diffusion argument, we use the number of other countries in a given subregion that have fiscal rules in place to predict the probability of having them at the country level. We find that in election years with fiscal rules in place, public consumption is reduced by 1.65% point of GDP. Furthermore, the effectiveness of these rules depends on their type, their institutional design, whether they have been in place for a long time and finally on the degree of competitiveness of elections. These results are robust to an augmented empirical strategy with an additional instrument that allows us to test for over-identifying restrictions. We also find that political budget cycles are particularly strong in resource-rich countries. However, we did not find any robust effect of fiscal rules in this regard. Our results have precise policy implications regarding the design of fiscal rules in order to curb politically motivated public spending in developing countries.

Chapter 3 analyzes the effect of oil price shocks on the quality of selected national leaders measured as their level of education. I use a unique dataset covering more than 700 national leaders from 111 countries over three quarters of a century to examine the relation between oil price shocks and the selection of educated national leaders. I find that positive oil price shocks significantly reduce the probability of selecting a national leader with a high level of education (by up to 21 percent) in oil countries : what I named a 'leadership curse'. Moreover, it is particularly pronounced in countries under presidential regimes, those with a proportional voting rule and is present only in ethnically fragmented developing countries. I propose a theoretical framework to shed light on this latter finding. The model features the interaction between a prospective national leader and a coalition of ethnic chiefs.

The coalition offers an electoral support to a candidate in exchange for future favors once the latter takes office. Also, in order to guarantee that the new leader respects the deal, the coalition specifies a threat of coups or revolution. A positive oil price shock makes this threat (which is similar to a tax on the reward from office) credible. This situation therefore deter the candidacy of highly educated citizens who prefer to stay in the private sector. These findings suggest that natural resources may hamper economic development by reducing the chances of selecting competent leaders as previous empirical evidence (Besley et al. 2011) shows that educated leaders matter for economic growth.

Keywords : developing countries, election, fiscal capacity, fiscal discipline, fiscal rules, leadership curse, national leadership, natural resource curse, oil price shocks, political budget cycles, political selection, progressive taxation, revenue curse.

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ARP	Average Rate Progression
DPI	Data (of) Political Institutions
GDP	Gross Domestic Product
GMM	Generalized Method (of) Moments
ICRG	International Country Risk Guide
IFS	International Financial Statistics
IIPF	International Institute of Public Finance
IMF	International Monetary Fund
MDG	Millennium Development Goals
NELDA	National Elections Across Democracy (and) Autocracy
OECD	Organisation (for) Economic Co-operation (and) Development
PED	Pays En Développement
UCDP/PRIO	Uppsala Conflict Data Program / Peace Research Institute Oslo
UNCTAD	United Nations Conference (on) Trade And Development
WDI	World Development Indicators
WEO	World Economic Outlook

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INTRODUCTION GÉNÉRALE

La dotation en ressources naturelles, au lieu de représenter un atout majeur pour la prospérité économique, a plutôt contribué à l'appauvrissement dans certains pays. Ce phénomène, connu sous le nom de la « malédiction des ressources naturelles », suite aux travaux pionniers de Sach et Warner (2001), est l'un des puzzles les plus importants en économie. Plusieurs travaux ont alors poursuivi d'une part l'objectif de mieux comprendre les mécanismes sous-jacents et, d'autre part, le but d'identifier différentes manifestations de cette malédiction.

Notre thèse contribue à cette littérature en utilisant une approche à la fois théorique et empirique. Elle est centrée sur deux dimensions d'économie publique de la question de la « malédiction des ressources naturelles ». Ces deux dimensions sont les finances publiques et l'économie politique.

Le chapitre 1 s'intéresse au lien entre la richesse en ressources naturelles et la mobilisation des recettes fiscales dans les pays en développement (PED). Elle s'intéresse à la manière dont la dépendance en ressources naturelles peut affecter les incitations des gouvernements en matière d'effort de collecte des recettes fiscales. Ce chapitre poursuit l'objectif de répondre aux deux questions suivantes : Est-ce que l'abondance en ressources naturelles cause moins d'efforts de mobilisation de recettes fiscales dans les PED? Si oui, est-ce que la progressivité du système de taxation peut jouer un rôle? Ce chapitre contribue à la littérature aussi bien sur le plan théorique qu'empirique . Sur le plan théorique, dans ce chapitre, il est proposé une extension du cadre permettant d'analyser les incitations du gouvernement (Besley et Persson, 2009; 2010) afin d'inclure la progressivité du système de taxation. Ensuite, sur le plan empirique, ce chapitre amène deux contributions. La première est de proposer une stratégie empirique permettant d'identifier l'effet causal

des booms de ressources naturelles sur les recettes fiscales. Deuxièmement, il est montré empiriquement que cette manifestation de la « malédiction des ressources naturelles » n'est pas une fatalité, car la progressivité du système de taxation permet de l'atténuer.

Le chapitre 2, toujours dans un angle de finance publique, s'intéresse à l'interaction entre la richesse en ressources naturelles et une autre composante du budget du gouvernement : les dépenses publiques. Dans ce chapitre, nous analysons l'effet de l'abondance en ressources naturelles sur les dépenses publiques en période électorale dans les PED. Les questions de recherche auxquelles ce chapitre est dédié sont les suivantes : est-ce que les institutions budgétaires telles que les règles budgétaires permettent en général d'atténuer les comportements opportunistes des politiciens en période électorale en ce qui concerne les dépenses publiques dans les PED? Ensuite, comment est-ce que, d'une part, les ressources naturelles affectent ces cycles électoraux et d'autre part, y-a-t-il un rôle pour ces règles budgétaires dans cet environnement particulier? Ce chapitre empirique a plusieurs contributions. Premièrement, il propose une approche novatrice pour identifier l'effet causal des règles budgétaires sur les agrégats budgétaires. Ensuite, les résultats mettent en lumière les caractéristiques déterminantes des règles budgétaires dans l'amélioration de la discipline budgétaire en période électorale. Puis, nous montrons que les cycles électoraux sont plus prononcés dans les pays riches en ressources naturelles. Enfin, malgré l'effet de discipline induit par les règles budgétaires en général, il n'y a pas de preuve robuste qu'elles soient efficaces dans un environnement dominé par les ressources naturelles.

Les chapitres 1 et 2 montrent que les ressources naturelles peuvent avoir des influences négatives sur les finances publiques dans les PED. Notamment, elles peuvent dans ces pays, donner lieu à des comportements non optimaux en matière budgétaire (dépenses publiques motivées par des considérations politiques et une faible incitation à mobiliser des recettes fiscales).

Le chapitre 3 est centré sur un angle d'économie politique. Ce chapitre examine l'effet des chocs des prix du pétrole en période électorale sur le niveau d'éducation des leaders nationaux. La question de recherche à laquelle ce chapitre est dédié est la suivante : est-ce que les chocs positifs de revenus tirés du pétrole favorisent l'arrivée au pouvoir de leaders moins éduqués (ou moins compétents)? Ce chapitre fait des contributions sur le plan théorique et empirique. Il contribue aux fondements politiques de la « malédiction des ressources naturelles » en se concentrant sur la période précédant le mandat des politiciens. Il se démarque ainsi des travaux précédents qui ne se sont intéressés qu'aux événements qui se déroulent aucours du mandat. Ce chapitre démontre aussi que les chocs positifs de revenus pétroliers en période électorale réduisent significativement les chances d'élire des leaders nationaux avec un niveau d'éducation élevé. En explorant les potentiels mécanismes sous-jacents, ce chapitre montre que ce phénomène, que nous avons dénommé la malédiction de leadership, semble provenir des PED ethniquement fragmentés. Enfin, ce chapitre propose un cadre théorique pour mieux expliciter ce dernier résultat.

Le chapitre 3 propose une analyse des origines profondes des effets contre-productifs des ressources naturelles dans certains pays. En effet, si des booms de ressources naturelles tendent à réduire les chances de sélectionner des leaders compétents, il s'en suit que les performances économiques futures seraient négativement affectées. Dans cette veine, Besley, Montalvo et Reynal-Querol (2011) ont montré que la transition d'un leader ayant un niveau d'éducation gradué vers un leader sans cette qualification, fait perdre en moyenne 2,1 points de pourcentage de croissance économique sur les cinq années à suivre. Plus récemment, Martinez-Bravo (2017) montre que les leaders locaux éduqués contribuent à une meilleure provision de biens publics dans les villages Indonésiens. Le lien avec les deux précédents chapitres est manifeste. Dans le chapitre 1, l'accent est mis sur l'effet des ressources naturelles sur les incitations des gouvernements à mettre en place un système de taxation efficace.

Le chapitre 3 indique que ce problème en matière de performance de collecte de recettes fiscales pourrait provenir du fait que les leaders soient peu compétents. En effet, le manque de compétence peut conduire à une incapacité à mettre en place les politiques publiques les plus efficaces (Caselli et Morelli, 2004).

Quant au chapitre 2, notons d'abord qu'il fait un lien entre la dimension des finances publiques et celle de l'économie politique. Ce chapitre fait ainsi le pont entre le chapitre 1 et le chapitre 3. À la lumière de ce dernier chapitre, plusieurs implications peuvent être tirées pour le chapitre 2. En premier lieu, une augmentation des dépenses publiques en période électorale est clairement un signal de mauvaise allocation des ressources publiques. En effet, l'impact des dépenses publiques sur le bien-être social ne devrait pas dépendre du calendrier électoral. Deuxièmement, l'abondance en resources naturelles permet aux politiciens de pouvoir financer des dépenses publiques en période électorale. Cette situation est de nature à complexifier les imputations de politiques publiques. En d'autres mots, il serait difficile pour les électeurs de savoir si les tenants du pouvoir sont compétents ou juste chanceux qu'il y ait eu une bonanza dans l'économie. Par conséquent, il est bien établi que les leaders politiques tendent à rester longtemps au pouvoir dans ces pays. Le chapitre 3 attire ainsi l'attention sur le fait que l'on devrait accorder plus de soin à l'effet des ressources naturelles sur la sélection des leaders nationaux. En effet, la capacité de ces leaders à affecter les performances économiques de long terme est d'autant plus importante que ces premiers demeurent longtemps au pouvoir.

Chapter 1

RESOURCE WINDFALL SHOCKS, PROGRESSIVE TAXATION AND TAX EFFORT IN DEVELOPING COUNTRIES

"It is shortage of resources, and not inadequate incentives, which limits the pace of economic development. Indeed the importance of public revenue from the point of view of accelerated economic development could hardly be exaggerated." (Kaldor, 1963)

Introduction

Ces dernières décennies, l'aide publique au développement a été au coeur du financement du développement. Plus récemment, un accent accru est mis sur la mobilisation des recettes fiscales domestiques, en d'autres termes la capacité des États à générer des ressources internes afin de pouvoir financer les besoins de développement.[1] Par exemple, en 2011, le centre de développement de l'OCDE estime qu' « afin d'atteindre les six premiers OMD, il fallait doubler le potentiel de mobilisation de recette fiscale ».[2] Par ailleurs, dans le cadre des objectifs de développement durable adoptés par les Nations Unies en Septembre 2015, la mobilisation des recettes fiscales occupe une place importante. En effet, la capacité fiscale qui se définie comme la capacité d'un gouvernement à lever des recettes fiscales, varie à travers

[1] Voir par exemple la déclaration de Doha sur le financement du développement Doha (2008), Busan partnership for effective development cooperation (2011) et Addis Ababa Action Agenda (United Nations, 2015).

[2] Traduction de l'anglais.

les pays. Par exemple, les pays à faible revenu collectent des recettes fiscales à hauteur de 10 à 20 pourcent de leur produit intérieur brut alors que dans les pays à haut revenu, cela représente autour de 40 pourcent de leur produit intérieur brut.

La dépendance en resources naturelles est l'une des raisons principales expliquant la faible capacité de certains pays en développement à lever des recettes fiscales (Besley et Persson, 2014).[3] C'est ainsi que McGuirk (2013) trouve que les gouvernements peuvent réduire le fardeau fiscal dans les pays africains riches en ressources naturelles afin de réduire la demande pour la responsabilité politique.

Le déclin des prix du pétrole ces dernières années a engendré une perte de recettes fiscales importante dans plusieurs pays dépendant de cette ressource.[4] The Wall Street Journal rapporte ainsi le cas de l'Angola qui est le second producteur Africain de pétrole, demandant l'aide du Fonds Monétaire International afin de faire face à l'effondrement des recettes publiques qui a suivi cette baisse de prix. L'État se trouve ainsi dans une incapacité à fournir un bien public de base tel que la gestion des ordures dans la capitale Luanda.[5] Ainsi, dans les pays en développement, la dépendance en ressources naturelles non renouvelables est un obstacle majeur à la viabilité des recettes publiques. La fiscalité joue un rôle primordial aussi bien pour assurer des recettes publiques viables que pour la fourniture des biens publics. La volatilité des revenus tirés des ressources naturelles couplée au caractère non renouvelable de ces dernières peuvent empêcher les gouvernments de fournir des biens publics dans le long terme (comme nous l'avons vu dans le cas Angolais).

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[3] Voir aussi Bräutigam (2008) qui documente qu'en dehors de l'Espagne impériale, aucun pays de l' OCDE n'a été aussi dépendant des resources naturelles que les pays en développement le sont aujourd'hui. Boadway et Keen (2009) rapportent par exemple que, durant les années 2000-2007, 72 % des revenus du gouvernement Algérien, 73 % de ceux du Congo Brazzaville et 77 % de ceux de la Guinée Équatoriale provenaient des hydrocarbures.

[4] Les prix du pétrole ont baissé significativement de 115 $ le baril en Juin 2014 et passent en-dessous de 35 $ en fin Février 2016.

[5] Source : http://www.wsj.com/articles/angola-to-seek-imf-aid-to-cope-with-looming-financial-crisis-1459957868

De plus, plusieurs travaux montrent que la capacité fiscale des pays peut avoir des effets positifs sur la gouvernance et la démocratie (Baskaran et Bigsten, 2012 ; Baskaran, 2014).

Question de recherche et méthodologie

Dans ce premier chapitre, nous analysons l'effet des rentes tirées des ressources naturelles sur l'effort de mobilisation des recettes fiscales dans les pays en développement qui sont riches en resources naturelles; puis nous démontrons que cet effet dépend de la progressivité du système de taxation. Il a été montré que dans ces pays, les gouvernements ont souvent peu d'incitation à mettre en place et à soutenir des systèmes de taxation efficients (Knack, 2009). Nous utilisons ainsi un cadre théorique provenant des travaux pionniers de Besley et Persson (2009, 2010) permettant d'analyser ce problème d'incitation. Besley et Persson (2009, 2010) argumentent en effet que certains pays riches en ressources naturelles pourraient avoir de faibles recettes fiscales en raison de leur faible niveau d'investissement dans leur capacité fiscale. Dans ce modèle, le gouvernement d'un pays riche en ressources naturelles doit choisir le niveau d'investissement dans sa capacité fiscale. Cet investissement dans la capacité fiscale correspond aux infrastructures fiscales qui améliorent la capacité de mobilisation de recettes fiscales par l'État (Besley et Persson, 2010). Ainsi, nous avons élargi ce cadre théorique afin d'incorporer la progressivité du système de taxation suivant l'approche de Pencavel (1979) et d'explorer les effets de cette dernière sur les incitations du gouvernement à investir dans sa capacité fiscale.

Le modèle théorique prédit qu'un pays riche en ressources naturelles disposant d'un système de taxation progressif aurait plus d'incitations à investir dans sa capacité fiscale. La raison est qu'un système de taxation progressif permet au gouvernement de lever plus de taxes sur les hauts revenus. En d'autres termes, le gouvernement espère un bon rendement de son investissement. Ce résultat théorique suggère donc

que l'effet négatif des ressources naturelles sur l'effort de mobilisation fiscale, aussi connu sous le nom de malédiction des revenus (Crivelli et Gupta, 2014) dépendrait de la progressivité du système de taxation. Dans ce qui suit, le fait que l'effet négatif des ressources naturelles sur l'effort de mobilisation fiscale soit dépendant de la progressivité est nommé l'hypothèse de la « malédiction de revenu conditionnelle ».

Dans la seconde partie du chapitre, nous testons empiriquement cette hypothèse de « malédiction de revenu conditionnelle ». L'estimation des effets des ressources naturelles sur les recettes fiscales représente un défi en raison d'un problème d'endogénéité. En effet, les pays riches en ressources naturelles pourraient simplement extraire plus de ressources naturelles car ils sont dans l'incapacité de lever efficacement des recettes fiscales. Comme mentionné précédemment, Knack (2009) montre que les pays riches en ressources naturelles ont très peu d'incitation à mettre en place ainsi qu'à maintenir des systèmes de taxation efficients en raison de leur forte dépendance des revenus tirés de ces ressources naturelles. La possibilité d'erreur de mesure des ressoures naturelles, représente également un problème potentiel. À cet effet, Van der Ploeg et Poelhoeke (2010) montrent que les rentes en ressources naturelles pourraient être sous-estimées en raison de la sur-estimation des coûts d'extraction. La littérature qui utilise les données pays (Bornhorst, Gupta et Thornton, 2009; Crivelli et Gupta, 2014) analyse l'effet des rentes de ressources naturelles sur l'effort de collecte de recettes fiscales en employant la méthode des moments généralisés pour traiter le problème d'endogénéité. Dans ce chapitre, nous traitons le problème d'endogénéité en utilisant la stratégie de variable instrumentale.

Contributions et résultats

La première contribution de ce chapitre est de montrer que tous les pays riches en ressources naturelles ne sont pas sytématiquement exposés de la même manière à la « malédiction des revenus ». À notre connaissance, ce chapitre est le premier travail de recherche à montrer que la progressivité atténue la « malédiction des revenus ».

La seconde contribution de ce chapitre consiste à proposer une approche permettant d'identifier l'effet causal des rentes de ressources naturelles sur les recettes fiscales. Nous avons ainsi construit pour chaque pays de l'échantillon un indice de prix de ressources naturelles et utilisé le taux de croissance de ce dernier comme instrument pour les rentes de ressources naturelles. Ainsi, notre approche utilise une source de variation plausiblement exogène des prix qui provient de leur détermination sur les marchés internationaux. L'argument est le suivant: une augmentation du prix des ressources naturelles pourrait conduire à une extraction plus accrue des ressources car le gouvernement s'attendrait à plus de revenus. Cette approche nous permet d'identifier de façon plausible l'effet causal des rentes de ressources naturelles. Il est également montré dans ce chapitre que les résultats sont robustes en prenant en compte le pouvoir de marché potentiel de certains pays.

Les résultats dans un échantillon de 57 pays en développement sur la période 1981-2005 montrent qu'une augmentation des rentes de ressources naturelles de 1 $ cause une réduction de 0,25 $ dans les recettes fiscales. Ce résultat est remarquablement proche de ceux de James (2015) pour les États-Unis. Cet effet est équivalent à une substitution partielle entre les revenus tirés des ressources naturelles et les recettes fiscales de 25 %. Cependant, la progressivité du système de taxation atténue cet effet négatif des ressources naturelles comme le modèle théorique l'a prédit. Ainsi, à la suite d'une augmentation des rentes tirées de ressources naturelles, les pays disposant d'un sytème de taxation progressif mobilisent plus de recettes fiscales que leurs homologues avec des niveaux de progressivité plus faibles. Plus spécifiquement, pour un niveau de progressivité équivalent à la moyenne des USA sur la période, un accroissement des rentes tirées de ressources naturelles d' 1 $ ne réduit les recettes fiscales que de 0,14 $.

La « malédiction des revenus » est conditionnelle et n'est donc pas inéluctable. Contrairement à l'approche traditionnelle selon laquelle la progressivité du système de taxation aurait un impact économique négatif en réduisant les incitations des individus hautement qualifiés ou en réduisant l'offre de travail, ce chapitre suggère qu'elle peut aussi être bénéfique. Ainsi, réformer les systèmes de taxation en renforçant la progressivité pourrait contribuer à améliorer la capacité fiscale des pays en développement qui sont riches en ressources naturelles.

Littérature associée

Ce chapitre se greffe à une littérature récente (Bornhorst *et al.*, 2009; Crivelli et Gupta, 2014; James, 2015) qui montre que les ressources naturelles ont un effet négatif sur l'effort de mobilisation des recettes fiscales. En particulier, Bornhorst *et al.* (2009) trouvent dans un échantillon de 30 pays producteurs d'hydrocarbures sur la période 1992-2005, une subsitution partielle de 20 % entre les revenus tirés des ressources naturelles et les recettes fiscales. Dans la même lignée, Crivelli et Gupta (2014) trouvent une substitution partielle de 30 % dans un échantillon de 35 pays riches en ressources naturelles sur la période 1992-2009. Finalement, James (2015) trouve que dans les États américains, cette substitution partielle est de l'ordre de 25 % comme mentionné précédemmant. Ce dernier résultat suggère donc que le phénomène n'est pas seulement présent dans les pays en développement. Ce chapitre complète la littérature en suggérant premièrement une stratégie empirique novatrice pour estimer l'effet causal des ressources naturelles sur les recettes fiscales en utilisant des données macroéconomiques (au niveau pays). Deuxièmement, ce chapitre utilise un grand échantillon de pays en développement et montre que la progressivité du système de taxation joue un rôle important dans le phénomène de la « malédiction des revenus ».

Ce chapitre a également un lien avec d'une part la littérature qui insiste sur le rôle des réformes de la fiscalité directe dans les pays en développement. Par exemple,

Besley et Persson (2014) rapportent le rôle historique que les réformes de l'impôt sur le revenu ont joué dans la capacité fiscale des pays qui sont aujourd'hui des pays à haut revenu (selon la classification de la Banque mondiale). De plus, le chapitre est aussi lié à Piketty et Qian (2009) qui soulignent l'importance de la progressivité dans la mobilisation des recettes fiscales en Chine et en Inde. D'autre part, ce chapitre est aussi relié à la littérature sur les aspects des finances publiques de la « malédiction des revenus » (Oechslin, 2010; Arezki et Brückner 2012*a*; et Van der Ploeg et Venables, 2011). Ainsi, Van der Ploeg et Venables (2011) argumentent que la réponse optimale face à une bonanza serait le développement du secteur non lié aux ressources naturelles en réduisant les distorsions liées aux taxes. Nos résultats sont compatibles avec leur argument puisque la fiscalité progressive fait partie des politiques les moins distortionnaires qui pourraient permettre au gouvernement de redistribuer les rentes tirées des ressources naturelles vers le reste de l'économie.

Le reste du chapitre est organisé comme suit. La section 1.2 présente le modèle théorique. La section 1.3 est consacrée à la description des données. La section 1.4 expose la méthodologie empirique et les résultats du test de l'hypothèse de « malédiction des revenus ». La section 1.5 quant à elle, décrit la méthodologie empirique et discute les résultats en ce qui concerne l'hypothèse de « malédiction conditionnelle des revenus ». Les sections 1.6 et 1.7 présentent respectivement les tests de robustesse des résultats et propose une discussion d'autres canaux potentiels à travers lesquels la progressivité pourrait opérer. Enfin, la section 1.8 conclut.

1.1 Introduction

Over the last decades, official development assistance has been the centerpiece of the financing of development. Recently, more and more interest is being devoted to tax revenues collection.[6] In 2011, the OECD Development Centre published a

[6]See for instance the declaration of Doha on financing for development (2008), the Busan partnership for effective development cooperation (2011) and the Addis Ababa Action Agenda (United Nations, 2015).

report showing that "achieving the first 6 MDGs [(Millenium Development Goals)] globally requires approximatively [...] twice the size of the potential increase in tax revenues obtainable from improved tax collection efforts in developing countries". Also, the Sustainable Development Goals adopted by United Nations in September 2015 highligths the importance of domestic resource mobilization through the target 17.1. Fiscal capacity, i.e the ability to effectively raise tax revenues varies largely across countries. For instance, low-income countries collect between 10 and 20 percent of GDP in taxes, while the average for high-income countries is around 40 percent. Natural resource dependence is among the key reasons behind "why do developing countries tax so little" (Besley and Persson, 2014).[7] In this vein, McGuirk (2013) finds that governments may lower the tax burden on citizens in order to reduce the demand for democratic accountability in African countries that are resource-rich.

The recent collapse of oil prices has deprived many oil-dependent countries of substantial public revenues.[8] The Wall Street Journal reports the case of Angola (Africa's second largest oil-producing country) seeking a bailout from the IMF in order to cope with the collapse in government revenues. It is also reported that the country has not been able to pay the company that removes the trash from the streets of its capital, Luanda, because of this lack of revenue.[9] Thus in developing countries, the dependency on nonrenewable natural resources is an obstacle to the sustainability of government revenues. Taxation is crucial both for a state's ability to raise revenues and to produce public goods. The volatility of natural resource revenues coupled with the fact that these resources are mostly nonrenewable may hinder the government's ability to provide public goods in the long run (as shown in Angola). In

[7] See also Bräutigam (2008) who stresses that except imperial Spain, no OECD country was ever reliant on resources revenues to the extend that many developing countries are now. For instance, Boadway and Keen (2009) report that over the period 2000-2007, 72% of Algeria's, 73% of Congo Brazzaville's and 77% of Equatorial Guinea's government revenue were hydrocarbon-related.

[8] Oil prices collapsed from a peak of $115 per barrel in June 2014 to under $35 at the end of February 2016.

[9] Source : http://www.wsj.com/articles/angola-to-seek-imf-aid-to-cope-with-looming-financial-crisis-1459957868

addition, there is evidence that the state's fiscal capacity have a positive effect on governance and democracy (Baskaran and Bigsten, 2012 ; Baskaran, 2014).

In this chapter, I focus on the effect of natural resource rent windfalls on tax revenues collection effort in resource-rich developing countries and I show that this effect is conditional on the progressivity of the tax system. It is well-known that in these countries, governments tend to have weak incentives to implement and sustain efficient tax systems (Knack, 2009). I therefore use a theoretical framework allowing to model this incentive problem. I exploit the innovative framework by Besley and Persson (2009, 2010). In this framework, a government in a resource-rich country has to decide how much to invest in its fiscal capacity (at a cost). Besley and Persson (2010) emphasize the fact that some resource-rich countries may have low levels of tax revenues because of their low investments in fiscal capacity. An investment in fiscal capacity corresponds to fiscal infrastructures that allow a government to increase its ability to tax (Besley and Persson, 2010). I incorporate to the model a progressive income tax following Pencavel (1979) in order to explore its effect on the incentives of the government of a resource-rich country to invest in fiscal capacity.

The model predicts that a resource-rich country with a progressive income tax has more incentives to invest in its fiscal capacity. It is because the progressive tax system allows the government to collect more taxes (on high incomes). In other words, this government has a high expected return to the investment in fiscal capacity. This theoretical result suggests that the negative effect of natural resources on tax collection effort, the "revenue curse" (Crivelli and Gupta, 2014), may be conditional on the progressivity of the tax system. Henceforth, I identify the fact that the negative impact of natural resource rents on tax revenues depends on the level of progressivity of the tax system as the "conditional revenue curse" hypothesis.

In the second part of the chapter, I propose an empirical test of the "conditional revenue curse" hypothesis. The estimation of the effect of natural resource revenues on

tax revenues is difficult because of an endogeneity problem. Resource-rich countries may extract more natural resources because they are unable to effectively raise tax revenues. Again, Knack (2009) shows that countries that are rich in natural resources tend to have weak incentives to implement and sustain efficient tax systems because they may rely too much on windfall revenues. It is important therefore to separate the causal effect of natural resources from the effect of inefficient tax policies on tax revenues. Another potential problem is the measurement error in resource rents. Van der Ploeg and Poelhoeke (2010) show that the overestimation of extraction costs may lead to an underestimation of natural resource rents. The cross-country literature (Bornhorst *et al.*, 2009; Crivelli and Gupta, 2014) analyzes the effect of natural resource revenues on non resource or tax revenues by employing the Generalized Method of Moment (GMM) in order to deal with the endogeneity problem. I tackle the endogeneity problem using an instrumental variable strategy.

The first contribution of this chapter is to show that one size does not necessarily fit all and hence the effect of natural resources on tax revenues may be heterogeneous among resource-rich countries. To the best of my knowledge, this chapter is the first to show that progressive taxation dampens the "revenue curse". The second contribution of this chapter is to identify the causal effect of natural resource rent windfalls on domestic tax revenues. For each country in the sample, I construct a natural resource price index and use its growth rate as an instrument for natural resource rent windfalls. Thus, the empirical strategy exploits at the country-level the plausibly exogenous variation coming from the international determination of natural resources' prices. The argument is the following. An increase in the price of a natural resource may lead to an increase in its extraction because governments expect more revenues. The instrumental variable approach, by allowing to exploit only the exogenous part of the variation in natural resource rent windfalls, has the potential to address the bias that may arise when estimating the effect of natural resources on tax revenues. Instrumenting for natural resource rents should deal with the bias due to the reverse causality problem, the potential measurement error in resource rents and omitted variables that may determine within country changes in tax revenues and resources'

extraction. The results are robust to taking into account the potential market power of some countries.

Using a sample of 57 developing countries over the period 1981-2005, I find that a $1 increase in natural resource rent windfalls causes a reduction in domestic tax revenues by $0.25. My estimate is remarkably identical to those found by James (2015) for the United States. It indicates a partial substitution between natural resource revenues and tax revenues of 25%. However, progressive taxation dampens the detrimental effect of natural resources on fiscal capacity as predicted by the theoretical model. Following a resource windfall, countries with higher degrees of progressive taxation collect more tax revenues than their counterparts with lower levels of progressive taxation. In particular, at a level of structural progressivity equivalent to twice the sample average, an increase in resource rent windfalls of $1 reduces domestic tax revenues by only $0.14.[10] The "revenue curse" is conditional and therefore does not seem to be cast in stone. Conversely to the traditional idea that progressive taxation may have a negative economic impact by harming the incentives of high skilled individuals or by leading to a reduction in labor supply, this chapter suggests that progressive taxation may also have positive effects. Policy reforms aimed at strengthening progressive taxation may help resource-rich countries to enhance their fiscal capacity.

This chapter is related to a recent literature (Bornhorst *et al.*, 2009; Crivelli and Gupta, 2014; James, 2015) showing that natural resource revenues have a negative effect on tax collection efforts by governments. More specifically, Bornhorst *et al.* (2009) find in a sample of 30 hydrocarbon producing countries over the period 1992-2005 that there is a partial substitution of 20% between government revenues from hydrocarbon related activities and revenues from other domestic sources. Also,

[10]This level of structural progressivity (0.05) is close to the average in the US over the period which is roughly 0.06. However, it is less than the average structural progressivity of the 24 OECD member countries over the period, which is 0.09. The structural progressivity captures changes in the calculated nominal tax burden along the income distribution. This notion was introduced by Musgrave and Thin (1948).

Crivelli and Gupta (2014) in a sample of 35 resource rich countries over the period 1992 to 2009 find a partial substitution of 30%. Again, James (2015) finds that in the US, an increase in resource revenues, results in a decrease in non resource revenues equivalent to a partial substitution of 25%. This last finding suggests that the phenomenon is not confined to developing countries. This chapter complements the literature firstly by suggesting a novel empirical strategy for cross-country studies in order to estimate a causal effect of natural resources on tax revenues. Secondly, this chapter uses a larger sample of countries and shows that the progressivity of the tax system matters.

This chapter is also related, on one hand, to a literature emphasizing the role of income tax reforms in developing countries. For instance, Besley and Persson (2014) stress the role of income tax reforms in increasing the fiscal capacity of today's high-income countries. More closely related, Piketty and Qian (2009) highlight the importance of progressive income taxation in tax revenues collection performance in China and India. On the other hand, it is also related to the literature on the public finance aspect of the "resource curse" (Oechslin, 2010; Arezki and Brückner 2012*a*; Van der Ploeg and Venables, 2011). For instance, Van der Ploeg and Venables (2011) argue that the optimal response to windfall revenues involves growing the non-resource sector by reducing distortionary taxation. My findings complement their argument as progressive taxation is among the least distortionary policy tools that may allow the government to redistribute the windfall gains.

The remainder of the chapter is organized as follows. Section 1.2 presents the theoretical framework. Section 1.3 describes the data. Section 1.4 outlines the empirical strategy and the results for testing the revenue curse. Section 1.5 outlines the empirical approach and discusses the results regarding the conditional revenue curse hypothesis. Section 1.6 presents robustness tests and Section 1.7 discusses other potential channels through which progressive taxation may operate to dampen the "revenue curse". Finally, Section 1.8 concludes.

1.2 Model

In this section, I analyze the incentive problem that a resource-rich government faces when choosing the amount of investment in the ability to raise tax revenues. The model presented here stems from Besley and Persson (2010) and Cárdenas *et al.* (2011). I extend their framework by introducing progressive income taxation. This theoretical section is meant to set the stage for the empirical analysis.

1.2.1 Setup

The model is composed by two periods, s=1, 2 and the world ends after the second period. The population has a size normalized to 1 and divided in 2 groups. Each group represents a share θ_j of the total population, with $j \in \{I, O\}$ and $\theta_I + \theta_0 = 1$. From the perspective of the second period, the group in power at the end of the first period is the incumbent government (I_1) that may stay in power with an exogenous probability γ. The opposition group is denoted O_1. The winner in the political transition process, becomes the new incumbent (I_2) and the looser becomes the new opposition (O_2). The government (I_s) sets a group-specific tax rate on the income of each individual (t_{js}) at the end of each period. Particularly at the end of the first period, I_1 also chooses the level of the investment in the next period's fiscal capacity. In addition to income taxation, each period, the government gets exogenously determined natural resource rents R from its own stock of natural resources. In order to make the model tractable, I assume without loss of generality, that individuals earn an exogenous market income which is group-specific.[11]

1.2.2 Preferences of individuals

Following Cárdenas *et al.* (2011), the utility of individuals in period s is linear in consumption as in Besley and Persson (2010) but quasi-linear in the public good. I

[11]In the original version, the market income depends on the legal support to each group.

introduce nonlinear taxation following Pencavel (1979). An individual of group j's utility takes the following form:

$$v_{js}(t_{js}, G_s) = \alpha_s V(G_s) + C_{js} \equiv \alpha_s V(G_s) + W_j - t_{js} W_j^{\sigma} \tag{1.1}$$

where G_s is the level of public goods, $V(\cdot)$ is a strictly concave function of G_s : $V_G(\cdot) > 0$, $V_{GG}(\cdot) < 0$ with $V(0) = 0$. The concavity of $V(\cdot)$ implies that the marginal utility of public goods consumption is diminishing. W_j is the group-specific exogenous market income and C_{js} is the private consumption (the market income after tax). σ is the parameter capturing the degree of progressivity of the income tax schedule (with $\sigma > 1$). When $\sigma = 1$, the income tax is linear and when $\sigma > 1$, the income tax is progressive because the marginal tax rate increases with respect to W_j. The progressivity of the income tax is therefore increasing in σ. The tax schedule exhibits a particular non linear form such that the average tax rate increases with pre-tax income.[12] α_s is a parameter reflecting the valuation of public goods in the economy. α_s has a two-point distribution $\{\alpha_L, \alpha_H\}$, with $\alpha_H V_G(G_s) > 2 > \alpha_L V_G(G_s)$, and ϕ denotes the probability that $\alpha_s = \alpha_H$. α_H denotes a high public good valuation and α_L a low public good valuation. When α_H is realized, the economy is in a "common interest state" while if α_L is realized the economy is in a "redistributive state". In the "common interest state", it is desirable to produce a public good that every citizen regardless of its group, could consume. On the other hand, in the "redistributive state" the preference is in favor of private consumption.

1.2.3 Government

The only constraint on tax policy is the level of fiscal capacity τ_s which results from the choices of previous periods. The level of fiscal capacity for period 2 is chosen

[12] This modelling of progressive taxation is consistent with our measure of progressivity in the empirical analysis. In addition, it is similar to Corneo (2002). The only difference is that Corneo (2002) focuses on the residual progressivity which captures the elasticity of post-tax income to pre-tax income.

by the first period's incumbent. τ represents for example fiscal infrastructures that may allow the government to increase its ability to tax income (Besley and Persson, 2010). At the beginning of the first period, the government is endowed with an initial level of fiscal capacity τ_1. The initial stock of fiscal capacity does not depreciate, but can be increased by I_1 through positive investments which cost $F(\tau_2 - \tau_1)$. $F(\cdot)$ is a linear function such that ($F_\tau > 0$ and $F_{\tau\tau} = 0$) with $F(0) = F_\tau(0) = 0$.[13] A higher fiscal capacity (τ_s) allows the incumbent I_s to raise more tax per citizen as $t_{js} \leq \tau_s$. In other words, a government cannot tax its citizen higher that its fiscal capacity can allow. In this model, to allow for a redistribution motivated by political considerations, tax rates can be negative. In other words, the government can choose to tax the opposition group in order to subsidize its own group. The government is subject to the following budget constraint in period s :

$$0 = (\theta_I t_{Is} W_I^\sigma + \theta_O t_{Os} W_O^\sigma) - G_s + R - \begin{cases} F(\tau_2 - \tau_1) \text{ if } s = 1 \\ 0 \qquad\qquad \text{if } s = 2 \end{cases} \tag{1.2}$$

The government collects income tax ($\theta_I t_{Is} W_I^\sigma + \theta_O t_{Os} W_O^\sigma$) and resource rents R that are used for public good (G_s) production. In particular in period 1, these government resources (tax and rents) are used to cover the cost of the investment in fiscal capacity ($F(\tau_2 - \tau_1)$).

1.2.4 Timing of events

Each period s is structured in three different stages. In the first stage, the group in power is known, the exogenous valuation of public goods α_s and natural resources rents R are realized. In the second stage, the incumbent makes the policy choices (the level of tax rates and the level of public goods). Moreover, the incumbent government of period 1 chooses the level of investment in fiscal capacity (τ_2). Finally, in the last stage individuals consume .

[13] I consider a linear cost function without loss of generality in order to make the model more tractable. I discuss the model in the theoretical appendix, assuming a general convex cost function with $F_{\tau\tau} \geq 0$.

The problem of the incumbent government is to maximize tax revenues and the utility of its own group. The incumbent puts therefore no weight on the utility of the opposition group. Let v_{Is} be the objective function of the incumbent government with $s \in \{1,2\}$. The problem of the first period is:

$$\underset{\{\tau_2, t_{I1}, t_{O1}, G_1\}}{\text{Max}} \quad v_{I1}(t_{I1}, G_1) = \alpha_1 V(G_1) + W_I - t_{I1} W_I^{\sigma} + \eta$$

$$\text{s.t}$$

$$G_1 = R - F(\tau_2 - \tau_1) + (\theta_I t_{I1} W_I^{\sigma} + \theta_O t_{O1} W_O^{\sigma})$$

$$t_{I1} \leq \tau_1,\ t_{O1} \leq \tau_1,\ G_1 \geq 0$$

where η is the expected payoff of the ruler of the first period. The payoff of the incumbent depends on the probability of staying in power (γ). Recall that the decision to invest in fiscal capacity is taken at the second stage of period 1.

The problem of the second period is:

$$\underset{\{t_{I2}, t_{O2}, G_2\}}{\text{Max}} \quad v_{I2}(t_{I2}, G_2) = \alpha_2 V(G_2) + W_I - t_{I2} W_I^{\sigma}$$

$$\text{s.t}$$

$$G_2 = R + (\theta_I t_{I2} W_I^{\sigma} + \theta_O t_{O2} W_O^{\sigma})$$

$$t_{I2} \leq \tau_2,\ t_{O2} \leq \tau_2,\ G_2 \geq 0$$

The main difference between the first and the second period problems is the decision to invest and the cost associated to the investment taking place only in the former. The maximization problem of the government is linear in the policy variables and this feature allows to solve the problem of optimal policies before the problem of the choice of the level of fiscal capacity for period 2 (τ_2).

1.2.5 Equilibrium policy : tax rates and and the provision of public goods

In the "common interest" state (high valuation of public goods), $\alpha_s = \alpha_H$. The incumbent government values the public good more than its private consumption because the marginal utility of public goods consumption is higher than the marginal utility of private consumption. This situation comes from the following assumption: $\alpha_H V_G(G_s) > 2 > \alpha_L V_G(G_s)$. It is therefore optimal for the incumbent I_s to tax its own group at the level of fiscal capacity ($t_{Is} = \tau_s$) and since it does not care about the opposition group, it implements ($t_{Os} = \tau_s$). In this equilibrium, both groups are taxed maximally (the tax rate is only constrained by fiscal capacity). The production of public good is given by:

$$G_s = \begin{cases} R - F(\tau_2 - \tau_1) + \tau_1(\theta_I W_I^\sigma + \theta_O W_O^\sigma) & \text{if } s = 1 \\ R + \tau_2(\theta_I W_I^\sigma + \theta_O W_O^\sigma) & \text{if } s = 2 \end{cases} \tag{1.3}$$

In the "redistributive state" (low valuation of public goods), $\alpha_s = \alpha_L$. The incumbent government values the public good less than its private consumption. In this case, no public good is provided ($G_s = 0$) and the opposition group is still taxed at the maximum level in order to subsidize the incumbent's group. Therefore, $t_{Os} = \tau_s$. Finally, substituting $t_{Os} = \tau_s$ and ($G_s = 0$) in the government budget constraint yields:

$$\begin{cases} -\theta_I t_{I1} W_I^\sigma = R - F(\tau_2 - \tau_1) + \theta_O \tau_1 W_O^\sigma & \text{if } s = 1 \\ -\theta_I t_{I2} W_I^\sigma = R + \theta_O \tau_2 W_O^\sigma & \text{if } s = 2 \end{cases} \tag{1.4}$$

The level of demand for common interest public good is central in the model. For $\alpha = \alpha_H$, the incumbent government uses its full fiscal capacity to tax and allocate the available revenues (net of the cost of investment in fiscal capacity in period 1) on pubic goods.

When public goods are not valued, no public good is produced and the incumbent government employs the available revenue to subsidize its own group (through negative tax rates).

Let λ_s be the realized value of government funds in period s. λ_s is obtained by differentiating the incumbent objective function with regard to Z_s, which is the net realized value of natural resource rents. Where $Z_s = R - F(\tau_2 - \tau_1)$ if $s = 1$ and $Z_s = R$ if $s = 2$. Thus, $\lambda_s = Max[\alpha_s V_G(Gs), 1]$.

1.2.6 Equilibrium fiscal capacity

Equilibrium policies are used to write the expected payoff of the incumbent at stage 2 of period 2, considering the fiscal capacity of period 2 (τ_2) as given. The expected payoff is given by :[14]

$$\begin{aligned}\eta = {} & \phi\alpha_2 V\left[\tau_2\left(\theta_I W_I^{\sigma} + \theta_O W_O^{\sigma}\right) + R\right] + \gamma\left\{\phi W_I - \phi\tau_2 W_I^{\sigma} + (1-\phi)\left[W_I + \theta_O\tau_2 W_O^{\sigma} + R\right]\right\} \\ & + (1-\gamma)\left\{\phi W_O - \phi\tau_2 W_O^{\sigma} + (1-\phi)\left[W_O + \theta_I\tau_2 W_I^{\sigma} + R\right]\right\} - \lambda_1 F(\tau_2 - \tau_1)\end{aligned} \tag{1.5}$$

λ_1 is the realized value of public revenues in the first period. The problem of the incumbent government I_1 is to choose the value of τ_2 which maximizes η. This problem is a trade off between the expected payoff of period 2 against the cost of investment in period 1 given the realized value of public funds. The incumbent takes into account the uncertainty about the future value of public goods, resource rents and the probability of staying in power.

The first order condition of the problem of I_1 is the following:

$$\begin{aligned}\lambda_1 F_{\tau_2}(\tau_2 - \tau_1) = {} & \phi\alpha_2\left(\theta_I W_I^{\sigma} + \theta_O W_O^{\sigma}\right) V_{G_2}\left[\tau_2\left(\theta_I W_I^{\sigma} + \theta_O W_O^{\sigma}\right) + R\right] - \gamma\phi W_I^{\sigma} \\ & + \gamma(1-\phi)\theta_O W_O^{\sigma} - (1-\gamma)\phi W_O^{\sigma} + (1-\gamma)(1-\phi)\theta_I W_I^{\sigma}\end{aligned} \tag{1.6}$$

Equation (1.6) shows that the level of investment in fiscal capacity is a function of the future valuation of public goods (α_2) , the probability of staying in power

[14]The details of the calculation are in Appendix A.

(γ), the level of progresivity (σ) and the level of resource rents (R). It states that the optimal level of investment in fiscal capacity equalizes its marginal cost to its marginal return. To explore the effect of natural resource rents R on investment in fiscal capacity, the first order condition (1.6) is used through the implicit function theorem. Let

$$\begin{aligned} Q = {} & \phi\alpha_2(\theta_I W_I^\sigma + \theta_O W_O^\sigma) V_{G_2}[\tau_2(\theta_I W_I^\sigma + \theta_O W_O^\sigma) + R] - \gamma\phi W_I^\sigma \\ & + \gamma(1-\phi)\theta_O W_O^\sigma - (1-\gamma)\phi W_O^\sigma + (1-\gamma)(1-\phi)\theta_I W_I^\sigma - \lambda_1 F_{\tau_2}(\tau_2 - \tau_1) \end{aligned}$$

By the implicit function theorem,

$$\frac{\partial \tau_2}{\partial R} = -\frac{1}{\left(\theta_I W_I^\sigma + \theta_O W_O^\sigma\right)} < 0 \tag{1.7}$$

The derivative in equation (1.7) shows the so-called "revenue curse" : higher natural resource rents lead to a lower investment in fiscal capacity. Equation (1.7) shows that the impact of a (positive) natural resource shock on the investment in fiscal capacity is negative and inversely proportional to the tax-base. The higher the tax-base, the weaker the curse will be. This result is intuitive. The government has two sources of benefit from an investment in fiscal capacity: tax revenues and the public good. Recall that the objective of the government is to maximize its own group utility (which depends on public good) and tax revenues. The government has therefore a strong incentive to invest in fiscal capacity as the expected payoff is high (high tax revenues and thus high public good provision in the second period) with progressive taxation.

Proposition: Progressive taxation unambiguously mitigates the "revenue curse" because returns to investments in fiscal capacity increases with progressivity of the tax system.

In order to prove the proposition, I show that:

$$\frac{\partial \tau_2}{\partial R \partial \sigma} = \frac{\theta_I W_I^{\sigma} lnW_I + \theta_O W_O^{\sigma} lnW_O}{\left(\theta_I W_I^{\sigma} + \theta_O W_O^{\sigma}\right)^2} > 0 \tag{1.8}$$

Equation (1.8) shows the conditional revenue curse: Progressive taxation dampens the "revenue curse". The intuition is linked to equation (1.7). As the progressive tax allows the government to collect more tax revenues (by taxing more high incomes), it increases the incentives of the government to invest in fiscal capacity. In other words, the progressivity of the tax schedule increases the expected returns (high tax revenues and thus high public good provision in the second period) from investing in fiscal capacity. This theoretical result can also be linked to Oechslin (2010).

The latter develops a theoretical framework where large windfall revenues lower the incentive to invest (by reducing the probability that the incumbent ruler will benefit from future returns on today's investments).[15] In this chapter, progressive taxation alleviate the incentive problem as follows. It increases tax revenues and thus public good provision that will benefit to all citizens. Indeed in the future, an incumbent can still benefit from an investment in fiscal capacity (through public good provision) even if she is no longer in power.

1.3 Data

To assess the empirical relevance of the impact of natural resources on fiscal capacity, I exploit a macroeconomic panel dataset on 57 developing countries over the period 1981-2005.[16] The sample contains 25 low income countries and 32 middle

[15]Note however that in Oechslin (2010), investments have a broader sens than here where the focus is on fiscal capacity.

[16]The choice of the period of analysis is constrained by the coverage of the data on structural progressivity.

income countries according to the World Bank's classification.[17] Table 1.14 in the Appendix shows the summary statistics of the different variables used in the empirical work. Detailed information about the variables used follow.

Domestic tax revenues

I use real domestic tax revenues per capita as the main measure for fiscal capacity. The data are constructed using domestic tax revenues in percentage of GDP from Baunsgaard and Keen (2010).[18] Domestic tax revenues are defined as total tax revenues excluding trade taxes.[19] Collecting domestic tax revenues requires an elaborate system of monitoring, enforcement, and compliance. Investment in fiscal capacity is strongly correlated with the effective fiscal capacity as underlined in the theoretical model. Indeed, in the theoretical model, taxation is only constrained by the level of investment in fiscal capacity, and the government taxes at its full fiscal capacity. A country with a high investment in fiscal capacity has the means to collect high tax revenues per citizen. Besides, using domestic tax per capita allows me to isolate the direct effect of natural resource windfalls on tax revenues as opposed to the case of a measure as share of GDP where one may worry about an effect through the GDP.[20]

Natural resource windfall

The natural resource rent data come from the World Bank. The World Bank's data

[17]The panel dataset is unbalanced which is quite frequent when working on developing countries because of weak data availability.

[18]real tax_pc $= \frac{\text{tax revenue}}{\text{GDP}} \times \frac{\text{GDP}}{\text{population}} \times \frac{100}{\text{Deflator}} = \frac{\text{tax revenue}}{\text{Population}} \times \frac{100}{\text{Deflator}}$.

[19]The use of the domestic tax revenues variables in per capita terms unlike much of the empirical works on tax revenues (Bornhorst *et al.*, 2009; Baunsgaard and Keen, 2010; Crivelli and Gupta, 2014), has its justification in the theoretical framework. I exclude trade taxes because collecting these taxes does not require high administrative capacity (Besley and Persson, 2014). Indeed, in order to collect trade taxes, it is sufficient to observe trade flows at borders. Domestic tax per capita is a proxy for fiscal capacity and, therefore, investment in fiscal capacity because it captures the tax amount that a government raises per citizen.

[20]However, I also use domestic tax revenues in percentage of GDP as an alternative measure in robustness tests in order to facilitate comparison with previous studies. Total tax revenues per capita are also used as an alternative measurement for fiscal capacity.

on natural resource rents are available for 14 different natural resources.[21] The World Bank defines the rent as the difference between the unit price and the unit cost multiplied by the production. Data are available for each of the 14 natural resources and are expressed in USD. I use the raw data to construct measures of natural resource rents in percentage of GDP. The GDP data come from the World Development Indicators. The total resource rent is obtained by summing the rent from the 14 resources. Overall I use three different measures which are the total resource rents, oil rents and other resource rents. All the resource rent measures are expressed in percentage of GDP. The share of resource rents in GDP captures the importance of resource rents in the economy and allows for cross-country comparison. I then calculate a measure of natural resource windfall as the yearly change in resource rents. In other words I first difference the data to compute the yearly change in resource rents.[22] This measure of windfall captures the change in the importance of natural resource rents in the economy over the period.

Structural progressivity

The data on the structural progressivity come from the Andrew Young School World Tax Indicators (Volume 1). They contain information on personal income tax reforms around the world over the period 1981-2005. Again, the availability of these data is the binding constraint on the period of analysis. Peter *et al.* (2010) constructed the data on Average Rate Progressions (ARP) which characterize the structural progressivity of national tax schedules with respect to the changes in the average rate along the income distribution. They compute the average tax rate for each country and each year at 100 different levels of pre-tax income that are evenly spread in the range from 4 to 400% of a country's per capita GDP. These income boundaries are suitable for comparison and are large enough to represent most of the actual income distribution (Peter *et al.* 2010). I use two variants of the ARP. The first measures the ARP up to an income level equivalent to 4 times the country's

[21] The natural resources are: bauxite, coal, copper, forest, natural gas, gold, iron ore, lead, nickel, oil, phosphate, silver, tin and zinc.

[22] This definition of windfall is similar to the one of Arezki and Brückner (2012*a*).

per capita GDP and assumes a linear relationship between the rates and the levels of income ($prog_1$).[23] $prog_1$ is therefore obtained by regressing average tax rates on the log of gross GDP. The second, $prog_2$ measures the ARP only for the levels of income in the middle portion of the income distribution (in the range from 100 to 300% of country's GDP per capita). It allows to account for the possibility of a non linear relationship between the rates and the levels of income ($prog_2$).[24] Figure 1.7 (shows the unweighted trend in the average structural progressivity in the sample. It shows that there is a significant variation in the structural progressivity in the sample over the period.[25]

The tax structure is interpreted as progressive, proportional or regressive if the ARP is positive, zero, or negative, respectively. The cases of zero or nearly zero structural progressivity in the sample are mostly one-rate flat tax rates that are not dependent upon on the level of income of individuals. The two measures of structural progressivity have also an important advantage for the empirical analysis. Peter *et al.* (2010) argue that because they are not derived directly from collected revenues and the existing income distribution of individuals, they are more exogenous than measures of effective progressivity.[26] While structural progressivity captures changes in the calculated nominal tax burden along the income distribution, effective progressivity describes changes in actual income inequality (Musgrave and Thin, 1948). Furthermore the measure is focused on structural measures that depend on the tax law (including for instance rates, deductions, exemptions and credits).

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[23] $prog_1$ corresponds to ARP_{all} and $prog_2$ corresponds to ARP_{mid} in the database from the Andrew Young School World Tax Indicators (Volume 1). The average tax rates are computed as the ratio of total tax liability to gross income. See Peter *et al.* (2010) for more details.

[24] Table 1.29 in Appendix shows the average level of structural progressivity for each country in the sample.

[25] See Peter *et al.* (2010) for a detailed description of the trend in structural progressivity over the period.

[26] Figure 1.4 shows that although their construction rely on the level of GDP as a proxy for income distribution, the two measures of the structural progressivity do not appear to be correlated with real GDP per capita. Figure 1.4 then supports the fact that $Prog_1$ and $Prog_2$ are probably not endogenous as argued by Peter *et al.*(2010).

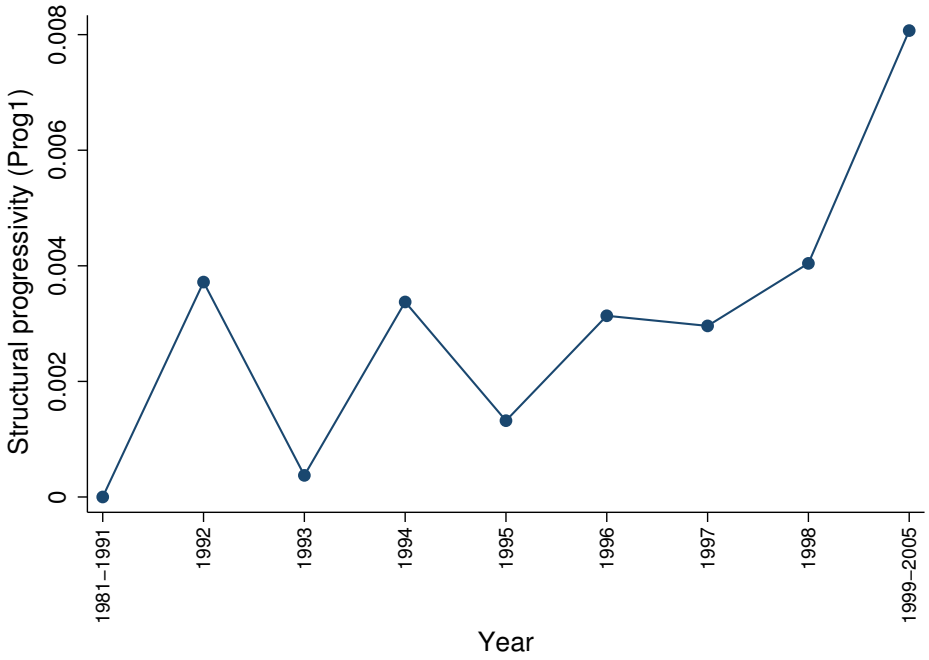
How well does this measure of structural progressivity capture income tax reforms over the period? In order to answer this question, I take the case of India. As discussed by Piketty and Qian (2009), India has an old income tax system dating back to 1922 (created by the British). In addition, many income tax reforms were implemented over the period 1981-2005 as shown in Table 1.1. Figure 1.1 shows the trend in structural progressivity across income tax reforms in India over the period. From 1981 to 1991, the structural progressivity is nearly zero. The changes in the number of brackets in the early 1980s makes it difficult to compare tax schedules in the beginning of the period. However, the measure of structural progressivity shows a significant variation starting in 1992. I therefore compare two consecutive reforms (as they are often close) starting in 1992 to evaluate whether the changes in structural progressivity mirror how a given reform affects the overall progressivity of the tax schedule.

1992 vs 1993: Figure 1.1 shows that the structural progressivity decreased between the two periods

In 1993, the new tax schedule increased the exemption threshold (from Rs 22,000 in 1992 to Rs 28,000). In addition as shown in Table 1.1 , the top tax rate is reduced from 50% to 40%. Note also that there was a 12% surcharge on taxable income over Rs 75,000 (in 1992) and on taxable income over Rs 100,000 (in 1993).[27] Figure 1.1 shows that $prog_1$ captures the fact that the tax schedule in 1992 is more progressive than the tax schedule in 1993. This difference in progressivity comes from the change in the exemption threshold and the surcharge rates between the two tax schedules.

[27]These surcharges imply that the top effective tax rate is 56% and 44.8% respectively in 1992 and 1993.

Figure 1.1
Trend in structural progressivity across tax reforms in India



Notes: This figure shows the trend in the level of structural progressivity across periods of tax reforms in India. Prog1 is the main measure of structural progressivity assuming a linear relationship between the rates and the levels of income.

1994 vs 1995: Figure 1.1 shows that the structural progressivity decreased between the two periods and

1996 vs 1997: Figure 1.1 shows that the structural progressivity was similar between the two periods

In 1995, the new tax schedule increases the exemption threshold (from Rs 30,000 in 1994 to Rs 35,000). Also, in 1994 there was a 12% surcharge on taxable income over Rs 100,000 while there was none in 1995. Figure 1.1 shows that the structural progressivity captures the fact the the tax schedule was more progressive in 1994

than it was in 1995. This difference in progressivity comes also from the change in the exemption threshold and the surcharge rate. The two tax schedules in 1996 and 1997 are similar. The only difference is that the top rate is 50% in 1997 while it is 40% in 1996. The structural progressivity captures the similar degree of progressivity of these two tax schedules.

1998 vs 1999-2005: Figure 1.1 shows that the structural progressivity increased between the two periods

In 1999, the new tax exemption threshold was increased (from Rs 40,000 in 1998 to Rs 50,000). As Figure 1.2 shows, the structural progressivity captures the reduction in the degree of progressivity between 1998 and 1999 due to the increase in the exemption threshold. However, note that in 2000, there was a 10% surcharge on taxable incomes over Rs 60,000. Also, in 2001, in addition to the 10% surcharge on taxable income over Rs 60,000 there was a surcharge on taxable incomes over Rs 150,000. There were also other surcharges on the following years which explain why the tax schedule has been more progressive over 1999-2005 than in 1998.[28] Figure 1.2 shows in detail how the structural progressivity varies over the period 1999-2005. For instance, Figure 1.2 shows that the tax schedule in 2001 is more progressive than the one in 2000. This difference in progressivity is due to the additional 15% surcharge on taxable incomes over Rs 150,000. Figure 1.1 and Figure 1.2 show that prog_1 captures the overall movement in the progressivity of tax schedule. As mentioned earlier, the structural progressivity captures changes in the tax law such as the rates and the exemptions.

[28]The structural progressivity was averaged over the period 1999-2005.

Table 1.1 Progressive Income Tax Schedules in India, 1981-2005

1981		1982		1983		1984	
Brackets of annual income (Rs)	Marginal tax rate	Brackets of annual income (Rs)	Marginal tax rate	Brackets of annual income (Rs)	Marginal tax rate	Brackets of annual income (Rs)	Marginal tax rate
0 - 8 000	0%	0 - 15 000	0%	0 - 15 000	0%	0 - 15 000	0%
8 001 - 15 000	15%	15 001 - 25 000	30%	15 001 - 20 000	25%	15 001 - 20 000	20%
15 001 - 20 000	18%	25 001 - 30 000	34%	20 001 - 25 000	30%	20 001 - 25 000	25%
20 001 - 25 000	25%	30 001 - 50 000	40%	25 001 - 30 000	35%	25 001 - 30 000	30%
25 001 - 30 000	30%	50 001 - 70 000	50%	30 001 - 50 000	40%	30 001 - 40 000	35%
30 001 - 50 000	40%	70 001 - 100 000	55%	50 001 - 60 000	50%	40 001 - 50 000	40%
50 001 - 70 000	50%	over 100 000	60%	60 001 - 70 000	52.5%	50 001 - 70 000	45%
70 001 - 100 000	55%			70 001 - 85 000	55%	70 001 - 100 000	50%
over 100 00	60%			85 001 - 100 000	57.5%	over 100 001	55%
				over 100 000	60%		

1985-1989		1990-1991		1992		1993	
Brackets of annual income (Rs)	Marginal tax rate	Brackets of annual income (Rs)	Marginal tax rate	Brackets of annual income (Rs)	Marginal tax rate	Brackets of annual income (Rs)	Marginal tax rate
0 - 18 000	0%	0 - 18 000	0%	0 - 22 000	0%	0 - 28 000	0%
18 001- 25 000	25%	18 001- 25 000	20%	22 001- 30 000	20%	28 001 - 50 000	20%
25 001 - 50 000	30%	25 001 - 50 000	30%	30 001 - 50 000	30%	50 001 - 100 000	30%
50 001 - 100 000	40%	50 001 - 100 000	40%	50 001 - 100 000	40%	over 100 000	40%
over 100 000	50%	over 100 000	50%	over 100 000	50%		

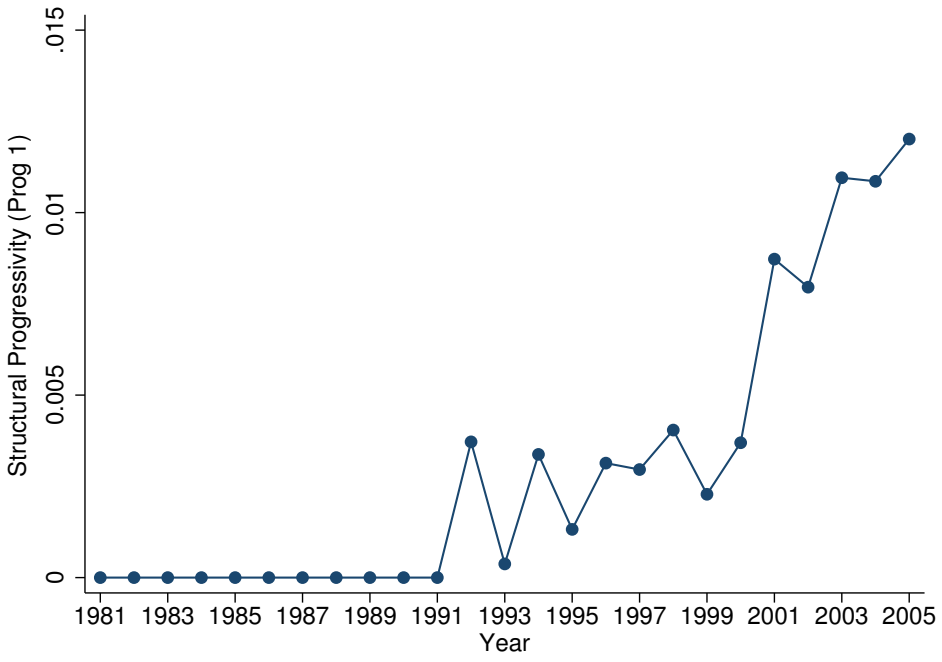
1994		1995		1996		1997	
Brackets of annual income (Rs)	Marginal tax rate	Brackets of annual income (Rs)	Marginal tax rate	Brackets of annual income (Rs)	Marginal tax rate	Brackets of annual income (Rs)	Marginal tax rate
0 - 30 000	0%	0 - 35 000	0%	0 - 40 000	0%	0 - 40 000	0%
30 001 - 50 000	20%	35 001 - 60 000	20%	40 001 - 60 000	20%	40 001 - 60 000	20%
50 001 - 100 000	30%	60 001 - 120 000	30%	60 001 - 120 000	30%	60 001 - 120 000	30%
over 100 000	40%	over 120 000	40%	over 120 000	40%	over 120 000	50%

1998		1999-2005	
Brackets of annual income (Rs)	Marginal tax rate	Brackets of annual income (Rs)	Marginal tax rate
0 - 40 000	0%	0 - 50 000	0%
40 001 - 60 000	10%	50 001 - 60 000	10%
60 001 - 150 000	20%	60 001 - 150 000	20%
over 150 000	30%	over 150 000	30%

Note : India's income tax applies to individual income, not to household income (except for Hindu Undivided Families). The general principle is that all income sources are subject to the same tax rates (the progressive tax schedule applies to the sum of all individual incomes, whatever the source). See Piketty and Qian (2009). The tax schedules reported in this table also do not include "temporary" tax surcharges (for instance, a 10% tax surcharge has been applied to all incomes above 60 000 Rs in 2000, so that the effective top rate is 33% rather than 30%). Note also that the years reported are financial years (as opposed to assessment years), i.e the year in which the income is earned starting from April 1st and ending on March, 31st. Before 1991-1992, the data are taken from the Teamwork (http://www.theteamwork.com/finance/2637-government-india-income-tax-slab-rates-ay-1983-1984.html) and after this period from the Income Tax Department's website. Teamwork compiles information from Indian Government declarations.

Figure 1.8 (in the Appendix) displays the correlation between the average degree of structural progressivity and the average domestic tax revenues per capita (in logarithm). It shows that there is a positive and statistically significant correlation between the measures of structural progressivity and domestic tax revenues no matter the income group. The positive correlation is consistent with the theoretical intuition. It is suggestive the high return to the investment in fiscal capacity under progressive taxation (leading to high investment in fiscal capacity and thus high tax revenues).

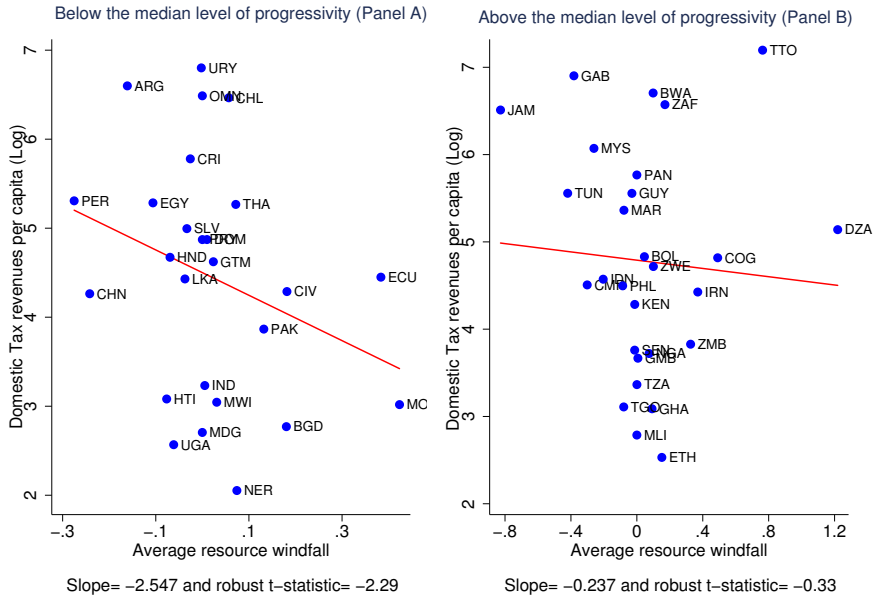
Figure 1.2
Trend in structural progressivity over the period in India



Notes: This figure shows the trend in the level of structural progressivity over the period in India. Prog1 is the main measure of structural progressivity assuming a linear relationship between the rates and the levels of income.

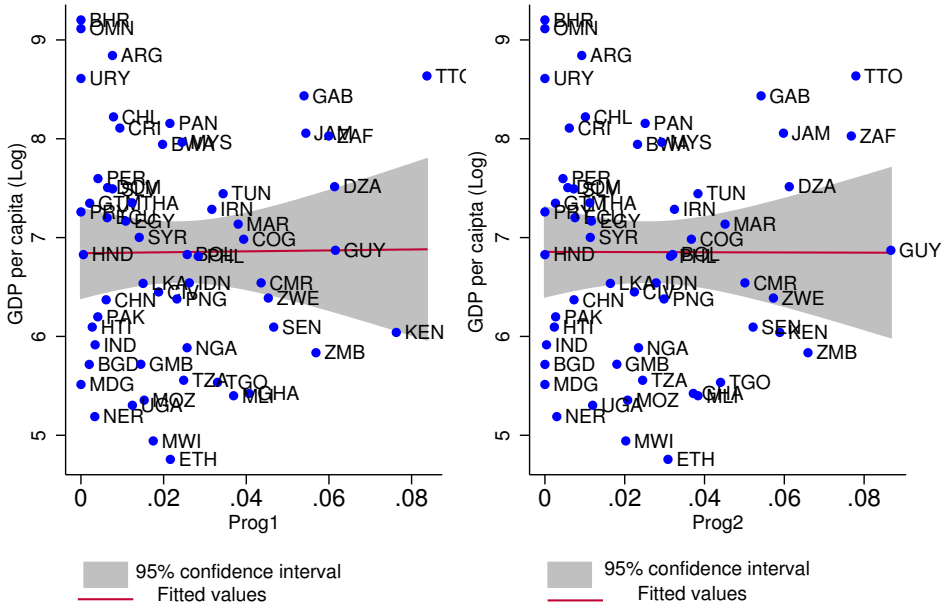
In addition, Figure 1.3 shows the correlation between domestic tax revenues and natural resource windfalls for countries with an average progressivity below and above the median structural progressivity in the sample (0.02). It shows, consistently with the theory, that the "revenue curse" is less pronounced in the subsample of countries with a structural progressivity above the median progressivity in the sample. Overall, this figure suggests a conditional revenue curse: Countries with a high degree of progressivity may have more incentive to invest in fiscal capacity and therefore collect more domestic tax revenues. Finally 1.4 suggests as discussed previously that the two measures of progressivity are plausibly exogenous as discussed in Peter *et al.* (2010).

Figure 1.3
Conditional revenue curse



Notes: This figure shows the correlation between tax revenues and resource windfalls for countries with an average structural progressivity below and above the median structural progressivity in the sample (0.02).

Figure 1.4
Correlation between structural progressivity and GDP per capita



Other controls

Following the empirical literature on the determinants of tax revenues (Rodrik, 1998; Baunsgaard and Keen, 2010), I control for potential confounding factors. In particular, resource windfalls may affect tax revenues through for instance their effects on the tax-base, the macroeconomic conditions and institutions. In order to address these issues, the empirical analysis should include respectively controls for the the tax-base (the real GDP per capita), macroeconomic conditions (inflation) and the institutional quality (civil conflicts and governance indicators). In addition, I also take into account other potential determinants of tax revenues such as trade openness and the size of the agricultural sector in the economy.

The GDP per capita may capture the level of development and the tax administration capacity of a country. Real GDP per capita in terms of constant USD 2000 is from the World Development Indicators (WDI). High income level may induce a greater demand for public services and so a positive correlation with the tax revenues is expected (Wagner's Law stating that public expenditures rise as countries become richer). Data on the annual change of the Consumer Price Index are from the International Financial Statistics. According to the Keynes-Olivera-Tanzi effect through which high inflation reduces the tax base, I expect a negative effect on tax revenues.[29]

I also control for variables that capture the quality of institutions or the quality of governance. I consider two variables on armed conflicts from the UCDP/PRIO conflict Dataset (Version 4-2014).[30] Internal conflict is a dummy variable which takes the value of 1 if in a given year there is an internal armed conflict and 0 otherwise.

External conflict is a dummy variable which takes the value of 1 in a given year if there is an interstate armed conflict and 0 otherwise. Because Besley and Persson (2009) argued that internal conflicts may have a detrimental effect on the incentive to build state capacity, I expect a negative effect on tax revenues. Besides, they also argued that because external conflicts are an important source of common interest public goods, they may positively affect tax revenues.

I also consider three variables on governance quality from International Country Risk Guid (ICRG). The first one is the corruption index ranging from 0 (highest degree of corruption) to 6 (lowest degree of corruption). Corruption is expected to have a negative effect on the fiscal capacity and so a positive sign is expected given the structure of the index.

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[29]The Keynes-Olivera-Tanzi effect refers to the fact high inflation may reduce real tax revenue because of the delay between the moment a taxable event occurs and the effective collection of the tax.

[30]Uppsala Conflict Data Program (UCDP)/ International Peace Research Institute (PRIO), Gleditsch *et al.*(2002).

The second variable is the democratic accountability. The index ranges from 0 to 6 and increases in the degree of democratic accountability.

The index of democratic accountability is a measure of how responsive a government is to its peoples. The intuition is that the more a government is responsive to its peoples the more likely they will pay their taxes.

The last variable capturing the quality of governance is the quality of bureaucracy. The index ranges from 0 to 4 and increases with the quality of bureaucracy. It captures the strength and expertise to govern without drastic changes in policy or interruptions in government services. Therefore, the quality of bureaucracy may be positively correlated to tax revenues. Finally, I employ also the polity2 index from the polity IV database (Marshall and Jaggers, 2009). The polity2 index ranges from -10 to 10 and increases with the degree of democracy. The score is based on sub-scores for constraints on the chief executive, the competitiveness of political participation, and the openness and competitiveness of executive recruitment. The effect of polity2 score on taxation may be negative reflecting a political budget cycle in taxation.

Trade openness is defined as the share of exports and imports of goods and services in GDP and it is expected to have a positive effect on tax revenues. The reason is that more open economies tend to have larger public expenditures in order to cope with a higher degree of vulnerability to risk and to provide for higher needs for social insurance (Rodrik, 1998). The data on trade openness are from the WDI . The share of agriculture value added in GDP comes also from the WDI. The agricultural sector is often said to be a “hard to tax” sector. The more the share of agriculture value added in GDP is important, the less likely a government will be able to collect tax revenues. The effect is then expected to be negative.

Finally, the net official development assistance received in percentage of gross national income data come from the WDI. Since aid may relax the government's budget constraint, I expect a negative effect on tax revenues.

1.4 Testing the "revenue curse" hypothesis

I will present the econometric framework followed by the results regarding the "revenue curse".

1.4.1 Econometric specification

I begin by testing the "revenue curse" hypothesis which is the negative effect of natural resource rents on fiscal capacity. Let Y_{it} be a measure of fiscal capacity where i and t denote country and year respectively. The structural equation of interest is the following:

$$Y_{it} = \alpha_1 \text{windfall}_{it} + \alpha_2 X_{it} + \delta_i + \delta_t + \varepsilon_{it} \tag{1.9}$$

Where windfall_{it} is natural resource rent windfalls; X_{it} is a set of control variables; δ_i is a country fixed effect; δ_t is a year effect and ε_{it} is the error term. Countries fixed effects help remove all time invariant unobserved countries heterogeneities, while the year fixed effects control for changes common to all countries within the same year.[31] α_1 is the coefficient of interest and testing for the "revenue curse " hypothesis implies testing for $\alpha_1 < 0$.

The identification of α_1 is difficult because of the potential endogeneity of natural resource windfalls. First, resource-rich countries may extract more natural resources because they are unable to effectively raise tax revenues. Second, Knack (2009)

[31] I estimate the equation by the within estimator to eliminate the country fixed effects. I also use clustered standard errors at country level which correct the standard errors for arbitrary serial correlation.

shows that countries that are rich in natural resources tend to have weak incentives to implement and sustain efficient tax systems. Another potential problem is the measurement error in natural resource rents. Van der Ploeg and Poelhoeke (2010) argue that the overestimation of extraction costs may lead to an underestimation of natural resource rents. Note also that as I cannot exclude the resource sector from my measure of tax revenues, my estimates could be seen as the lower bound of the true effect of natural resource windfalls. In order to address these threats to the identification of the causal effect of natural resource rents, I develop an empirical strategy that relies on an original instrumental variable approach.

My empirical strategy relies on the variation in international prices of natural resources as an exogenous source of variation in natural resource windfalls. The two other components of the resource rent namely extraction cost and production are potentially plagued by measurement error and endogeneity respectively. The variation in the quantity of resources produced may change in response to within-country variation in institutions. Indeed, Robinson *et al.* (2006) show in their theoretical framework that politicians tend to over-extract natural resources relative to the efficient extraction path because they discount the future too much. Again, Van der Ploeg and Poelhekke (2010) show that the measure of resource rent may suffer from an overestimation of the marginal cost of resource extraction which may lead to underestimation of resource rents.

I construct a country-specific natural resource price index and use its growth rate as an instrument for natural resource windfalls. I follow Deaton (1999) and Brückner and Ciccone (2010) in computing the country-specific prices as : $\text{Price index}_{it} = \sum_{r=1}^{12} \varpi_{ir} \times \text{Price}_{rt}$ where ϖ_{ir} is the country i's time invariant export share of resource r and Price_{rt} is the international price of resource r in year t.[32] Because the

[32]Brückner, Chong and Gradstein (2012) employ a similar approach for their index of country-specific oil price shock. I obtain each country's export share of the resources from United Nations Conference on Trade and Development (UNCTAD) for the earliest year, i.e in 1995. The data were available from 1995 to 2013. The export share of a given resource is the ratio of this resource's

country-specific international price index uses a time invariant weight, it allows the measurement of price growth to be plausibly exogenous. The time invariant weights are not endogenous to policy change that may take place in response to the change in prices (Deaton, 1999).

In order to compute the index, the starting point is the raw data on monthly nominal international prices from the International Monetary Fund (IMF) supplemented by the data from the World Bank when the information is not available in the former.[33] All the prices are set equal to unity in 1995 in order to obtain a price index with 1995 as the base year. I construct the country-specific natural resource price index as a weighted average. Finally, I obtain the growth rate by first differencing the logarithm of the country specific price index.

The first stage using the country-specific international price growth as an instrument for resource windfalls is:

$$\text{windfall}_{it} = \beta_1 \text{Price growth}_{it} + \beta_2 X_{it} + \delta_i + \delta_t + \varepsilon_{it} \tag{1.10}$$

Where Price growth_{it} is the growth of the international price index of natural resources which is country-specific. As I control for year effects that capture common shocks, β_1 identifies a country-specific price shock. The first stage mechanism that I suggest is a positive correlation between the country specific international price growth and resource windfalls. That is $\beta_1 > 0$. The intuition is that since the weight is the share of a specific resource in exports, an increase in international prices may encourage resource extraction because governments should expect more revenues.

export over the total export of the country in 1995. In a robustness check, I also construct an alternative price index using 2000 as the base year and the resource's export share in 2000.

[33] All the prices are from IMF except for natural gas, silver and gold which are from the World Bank. The data on the international price of bauxite and the data on phosphate exports were not available. The monthly data were averaged across the calendar year to compute annual price series. The price of wood is used to capture the international price of forest rent.

In addition, ceteris paribus, an increase in the international price generates an increase in rents. Figure 1.5 shows the correlation between the instrument and natural resource windfalls. There is a positive and statistically significant correlation (that is consistent with the first stage mechanism) between the country specific price growth and the natural resource windfalls.

Figure 1.5
Correlation between the country-specific price growth and resource windfall

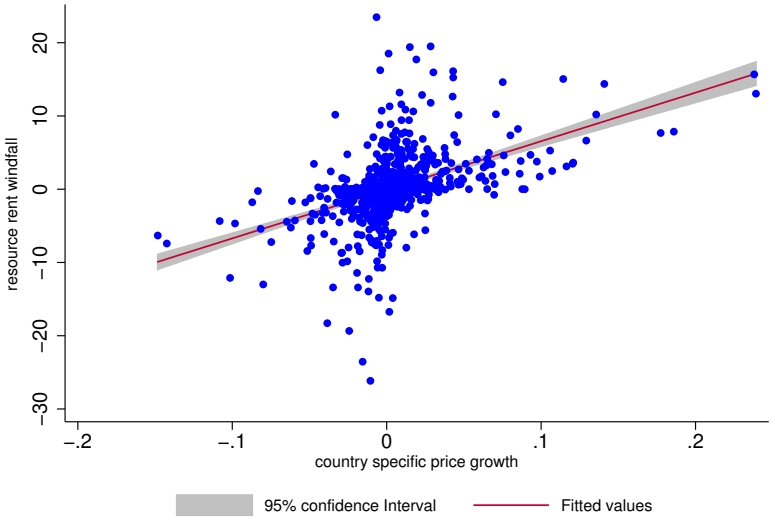


Table 1.2 presents the results for the first stage describing the correlation between the instrument (country-specific price growth) and the natural resource rent windfall. The estimates show that the price growth has a positive and statistically significant effect on natural resource windfalls. Indeed, 1 percent change in the price growth increases the resource windfall roughly by 0.49 percentage point. In addition, the first stage F-statistics are well above the rule of thumb threshold, suggesting that the instrument is not weak. The other variables that have a significant effect in the first stage are GDP per capita, agricultural value added and corruption.

The effect of corruption is consistent with the finding of Arezki and Brückner (2011). That is less corrupt countries may rely less on natural resources extraction.

Overall, my instrumental variable approach, by allowing to exploit an exogenous variation in natural resource rent windfalls, has the potential to address the bias that may arise when estimating the effect of natural resources on tax revenues. Instrumenting for natural resource rents may deal with the bias due to the reverse causality problem, the potential measurement error in resource rents and omitted variables that may determine within country changes in tax revenues and resource extraction.

Table 1.2
The revenue curse - First stage

Dependent variable: resource windfall	(1)	(2)	(3)	(4)
Price growth	49.978***	49.701***	49.267***	49.058***
	(5.365)	(5.396)	(5.169)	(5.188)
GDP per capita (Log)		-0.309	-1.367**	-1.343**
		(0.524)	(0.667)	(0.659)
Trade openness (Log)		0.021	-0.069	-0.030
		(0.485)	(0.489)	(0.482)
Inflation (Log)		-0.157	-0.121	-0.139
		(0.272)	(0.320)	(0.318)
Aid (Log)		3.038	2.733	2.786
		(2.632)	(2.548)	(2.508)
Agriculture Value Added (Log)			-2.055**	-2.088**
			(0.790)	(0.798)
Corruption (0: Bad 6: Good)				-0.151*
				(0.085)
Observations	1054	1054	1054	1054
Countries	57	57	57	57
F Stat (first stage)	86.77	84.85	90.86	89.41

Notes: All specifications include year dummies and the within estimator is used to eliminate country fixed effects. Clustered standard errors at country level in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

However, the plausible exogeneity of the instrument implies that the countries in the sample are mostly price takers. One may argue that some countries can have a market power and therefore may have an influence on these international prices. A previous study (Kilian, 2009) suggests in the case of oil that supply side shocks have a little influence on the real oil price over the period 1975-2007. In the light of this finding, oil prices are more sensitive to demand shocks and therefore it is correct to assume that these prices are under international determination. The present study is over the period 1981-2005 which is included in the period of Kilian (2009). The argument presented so far is focused on oil prices. I employ also thirteen (13) other natural resources. To the best of my knowledge, there is not a study similar to Kilian (2009) to inform us about the possibility of the market power regarding these 13 natural resources. The evidence about the case of oil, for which there is a solid organization of the producing countries (OPEC) that should grant a market power to the members could suggest the difficulty for producing countries in the case of the 13 natural resources to have a systematic influence on the determination of international prices. Despite this evidence on oil, I undertake a series of robustness checks by gathering information about the leading exporters of the 13 natural resources in order to identify countries with a potential market power. I will discuss this in more detail in section 1.6.

1.4.2 Baseline results: the “revenue curse”

Table 1.3 presents the results of the estimates corresponding to equation (1.9). The table shows OLS and IV estimates. In order to facilitate the comparison with the first stage estimates, Table 1.3 has the same exact structure as Table 1.2 . Note that the rest of the result tables in the chapter employ also the same structure. First, Table 1.3 shows the presence of the “revenue curse" (Crivelli and Gupta, 2014) in the sample. The comparison of the OLS estimates to the IV estimates reveals that the effect of resource windfalls is biased toward zero when using the OLS estimator.

The results suggest therefore that the OLS estimates suffer from an attenuation bias stemming from the potential underestimation of natural resource rents (Van der Ploeg and Poelhoeke, 2010). The results show that an increase in resource windfalls of 1 percentage point of GDP causes a reduction of 2.5% in domestic tax per capita collected (columns (2) and (8)). While this result is in line with previous findings (Bornhorst *et al.*, 2009; Crivelli and Gupta, 2014 and James, 2015), it can not be compared to them in terms of offset because the dependent variable is not appropriate for this purpose. In order to facilitate comparison to previous studies, I will employ a measure of domestic tax in percentage of GDP in robustness checks.

Table 1.3
The revenue curse - Baseline

Dependent variable: Domestic tax per capita (Log)	OLS (1)	IV (2)	OLS (3)	IV (4)	OLS (5)	IV (6)	OLS (7)	IV (8)
Resource windfall	-0.009***	-0.025*	-0.008***	-0.026**	-0.008***	-0.026**	-0.008***	-0.025**
	(0.003)	(0.013)	(0.002)	(0.011)	(0.002)	(0.011)	(0.002)	(0.010)
GDP per capita (Log)			1.072***	1.062***	1.061***	1.031***	1.053***	1.025***
			(0.139)	(0.135)	(0.145)	(0.139)	(0.140)	(0.136)
Trade openness (Log)			0.230**	0.232**	0.229**	0.230**	0.216**	0.217**
			(0.100)	(0.098)	(0.100)	(0.098)	(0.098)	(0.096)
Inflation (Log)			-0.173***	-0.179***	-0.173***	-0.178***	-0.167***	-0.172***
			(0.037)	(0.035)	(0.037)	(0.034)	(0.036)	(0.033)
Aid (Log)			-0.334	-0.270	-0.337	-0.278	-0.356	-0.298
			(0.470)	(0.459)	(0.470)	(0.458)	(0.452)	(0.442)
Agriculture Value Added (Log)					-0.021	-0.061	-0.009	-0.048
					(0.091)	(0.100)	(0.091)	(0.098)
Corruption (0: Bad 6: Good)							0.052**	0.048**
							(0.020)	(0.020)
Observations	1054	1054	1054	1054	1054	1054	1054	1054
Countries	57	57	57	57	57	57	57	57
F Stat (first stage)		86.77		84.85		90.86		89.41

Notes: All specifications include year dummies and the within estimator is used to eliminate country fixed effects. Clustered standard errors at country level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

1.5 Testing the conditional revenue curse hypothesis

I will present the econometric framework followed by the results regarding the conditional revenue curse hypothesis.

1.5.1 Econometric specification

Having established that natural resource windfalls cause lower tax revenues, now I test the conditional revenue curse hypothesis by introducing an interaction term reflecting the fact that the effect of natural resource rents on fiscal capacity may be conditional on the level of progressive taxation. The structural equation of interest in this context is the following:

$$Y_{it} = \theta_1 \text{windfall}_{it} + \theta_2 \text{windfall}_{it} \times \text{Prog}_{it} + \theta_3 \text{Prog}_{it} + \theta_4 X_{it} + \delta_i + \delta_t + \xi_{it} \quad (1.11)$$

Where Prog_{it} is the measure of structural progressivity. The fixed effects (δ_i) help remove all time invariant unobserved countries heterogeneities such as cultural preferences for redistribution. The coefficients of interest are θ_1 and θ_2. Testing for the conditional revenue curse hypothesis is equivalent to testing for $\theta_1 < 0$ and $\theta_2 > 0$. $\theta_2 > 0$ means that progressive taxation mitigates the "revenue curse" as predicted by the theoretical model. The theoretical prediction about the sign of θ_3 is ambiguous (see Appendix A). Now consider the effect of natural resource rent windfalls on domestic tax revenues in equation (1.11) as follows:

$$\frac{\partial Y_{it}}{\partial windfall_{it}} = \theta_1 + \theta_2 \times prog_{it} \quad (1.12)$$

In equation (1.11), as windfall_{it} is potentially endogenous for the reasons that are discussed in the previous section, $\text{windfall}_{it} \times \text{Prog}_{it}$ is also potentially endogenous. In order to addresss this issue and correctly identify θ_1 and θ_2, I use $\text{Price growth}_{it} \times \text{Prog}_{it}$ as instrument for $\text{windfall}_{it} \times \text{Prog}_{it}$.

There are two corresponding first stage equations as follows. The first stage equation for windfall$_{it}$ is:

$$\text{windfall}_{it} = \lambda_1 \text{Price growth}_{it} + \lambda_2 \text{Price growth}_{it} \times \text{Prog}_{it} + \lambda_3 \text{Prog}_{it} + \lambda_4 X_{it} + \delta_i + \delta_t + \zeta_{it} \tag{1.13}$$

and finally the first stage for the interaction term windfall$_{it} \times$ Prog$_{it}$ is:

$$\text{windfall}_{it} \times \text{Prog}_{it} = \gamma_1 \text{Price growth}_{it} + \gamma_2 \text{Price growth}_{it} \times \text{Prog}_{it} + \gamma_3 \text{Prog}_{it} + \gamma_4 X_{it} + \delta_i + \delta_t + \omega_{it} \tag{1.14}$$

Tables 1.4 and 1.5 present the result of the two first stages related to the test of the conditional revenue curse. Table 1.4 reports estimates from equation (1.13) and Table 1.5 is related to equation (1.14). The two tables show that the instruments have a positive and statistically significant effect on the corresponding endogenous variable. More specifically, a 1 standard deviation in the price growth increases the resource windfall by 0.63 standard deviation in Table 1.4 (Column (1)). Finally, Table 1.5 shows in column (1) that a 1 standard deviation in Price growth $\times$ Prog$_1$ increases windfall$\times$ Prog$_1$ by 0.57 standard deviation.

Table 1.4
The Conditional revenue curse - First Stage (resource windfall)

Dependent variable: resource windfall	(1)	(2)	(3)	(4)
$Prog_1$	-2.963	-4.059	-4.057	-3.634
	(4.094)	(3.982)	(4.199)	(4.044)
Price growth	62.875***	62.509***	62.365***	61.916***
	(14.585)	(14.665)	(14.529)	(14.411)
Price growth $\times$ $Prog_1$	-202.983	-198.740	-215.479	-208.469
	(218.066)	(219.064)	(215.109)	(214.536)
GDP per capita (Log)		-0.095	-1.326*	-1.381*
		(0.622)	(0.776)	(0.767)
Trade Openness (Log)		0.569	0.488	0.529
		(0.661)	(0.655)	(0.644)
Inflation (Log)		-0.058	0.045	-0.059
		(0.449)	(0.438)	(0.450)
Aid (Log)		4.183	3.389	3.493
		(3.479)	(3.573)	(3.515)
Agriculture Value Added (Log)			-2.398**	-2.447***
			(0.902)	(0.908)
Corruption (0:Bad 6: Good)				-0.206*
				(0.107)
Observations	850	850	850	850
Countries	57	57	57	57
F Stat (first stage)	33.66	33.74	36.26	36.41

Notes: All specifications include year dummies and the within estimator is used to eliminate country fixed effects. Clustered standard errors at country level in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 1.5
The Conditional revenue curse - First Stage (Interaction term)

Dependent variable: resource windfall× Prog_1	(1)	(2)	(3)	(4)
$Prog_1$	-0.170	-0.152	-0.152	-0.133
	(0.293)	(0.291)	(0.303)	(0.290)
Price growth	-0.212	-0.222	-0.226	-0.246
	(0.233)	(0.233)	(0.233)	(0.229)
Price growth × $Prog_1$	57.643***	57.629***	57.133***	57.450***
	(5.679)	(5.749)	(5.456)	(5.508)
GDP per capita (Log)		0.021	-0.016	-0.018
		(0.028)	(0.025)	(0.026)
Trade Openness		0.000	-0.002	-0.001
		(0.023)	(0.023)	(0.022)
Inflation (Log)		-0.020	-0.017	-0.022
		(0.015)	(0.015)	(0.014)
AId (Log)		0.160	0.136	0.141
		(0.164)	(0.168)	(0.164)
Agriculture Value Added (Log)			-0.071**	-0.073**
			(0.028)	(0.028)
Corruption (0: Bad 6: Good)				-0.009**
				(0.004)
Observations	850	850	850	850
Countries	57	57	57	57
F Stat (first stage)	66.38	64.36	71.78	70.84

Notes: All specifications include year dummies and the within estimator is used to eliminate country fixed effects. Clustered standard errors at country level in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

1.5.2 Baseline Results: the conditional revenue curse

The results in Table 1.6 are related to the test for the conditional revenue curse hypothesis i.e estimates related to equation (1.11). In all specifications, the direct effect of natural resource windfalls is negative and statistically significant. Also, all the specifications in Table 1.6 show a positive and statistically significant effect of the interaction term which is consistent with the conditional revenue curse hypothesis. The interpretation of the results in Table 1.6 follows equation (1.12).

In column (2), at a level of structural progressivity of 0.05 (corresponding to twice the sample average) a 1 percentage point increase in resource windfalls causes a reduction in domestic tax revenues per capita by only 1.21%.[34] This result depicts a dampening effect of the progressivity of the tax schedule. Regarding the coefficient of progressivity, it is not statistically significant in any specification.

[34]The marginal effect is computed as : $(-0.025 + 0.258 \times 0.05) \times 100$ where 0.05 is the value of the structural progressivity (Prog_1).

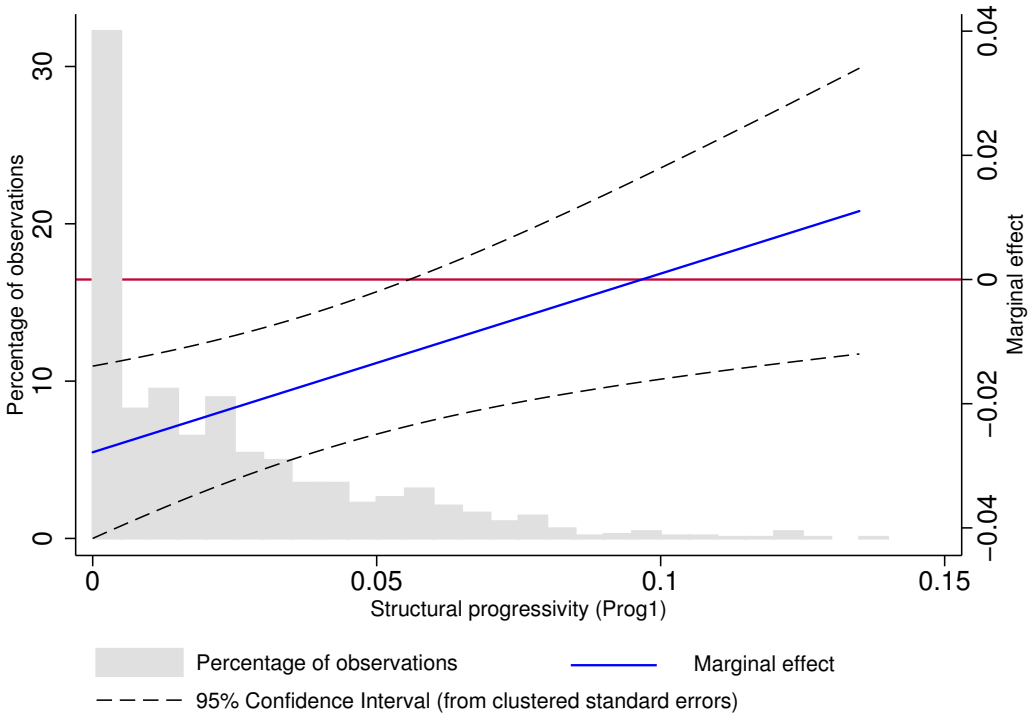
Table 1.6
The Conditional revenue curse - Baseline

Dependent variable: Domestic tax per capita (Log)	OLS (1)	IV (2)	OLS (3)	IV (4)	OLS (5)	IV (6)	OLS (7)	IV (8)
Resource windfall	-0.008***	-0.025***	-0.008***	-0.029***	-0.008***	-0.029***	-0.007***	-0.028***
	(0.003)	(0.008)	(0.003)	(0.007)	(0.003)	(0.007)	(0.003)	(0.007)
Resource windfall $\times$ $Prog_1$	0.147**	0.258**	0.118**	0.300***	0.122**	0.305***	0.122**	0.288***
	(0.065)	(0.108)	(0.053)	(0.108)	(0.052)	(0.107)	(0.054)	(0.107)
$Prog_1$	-0.155	-0.186	-0.160	-0.205	-0.159	-0.204	-0.236	-0.276
	(1.637)	(1.650)	(1.296)	(1.289)	(1.289)	(1.285)	(1.291)	(1.287)
GDP per capita (Log)			0.943***	0.938***	0.983***	0.956***	0.994***	0.967***
			(0.136)	(0.137)	(0.151)	(0.149)	(0.147)	(0.146)
Trade openness (Log)			0.274**	0.289***	0.276**	0.290***	0.268**	0.283**
			(0.118)	(0.111)	(0.117)	(0.111)	(0.116)	(0.110)
Inflation (Log)			-0.205	-0.206	-0.208	-0.207	-0.188	-0.190
			(0.143)	(0.140)	(0.141)	(0.139)	(0.144)	(0.141)
Aid (Log)			-0.100	-0.035	-0.076	-0.024	-0.098	-0.044
			(0.415)	(0.404)	(0.418)	(0.405)	(0.398)	(0.387)
Agriculture Value Added (Log)					0.077	0.035	0.087	0.045
					(0.085)	(0.093)	(0.086)	(0.093)
Corruption (0: Bad 6: Good)							0.040**	0.036*
							(0.019)	(0.019)
Observations	850	850	850	850	850	850	850	850
Countries	57	57	57	57	57	57	57	57
F Stat (first stage): equation (1.13)		33.66		33.74		36.26		36.41
F Stat (first stage): equation (1.14)		66.38		64.36		71.78		70.84

Notes: All specifications include year dummies and the within estimator is used to eliminate country fixed effects. Clustered standard errors at country level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

In order to shed more light on the conditional effect, Figure 1.6 shows the marginal effect of natural resources rent windfalls on tax revenues per capita derived from equation (1.12). The marginal effect is computed for each increment of 0.001 in structural progressivity using estimation (8) from Table 1.6 . The plot allows to show how the effect of natural resource rent windfalls on domestic tax revenues varies over the entire observed values of structural progressivity. The positive slope reflects the positive coefficient for the interaction term suggesting that progressive taxation dampens the "revenue curse". Figure 1.6 shows that resource windfalls may have a positive effect on domestic tax revenues for higher level of structural progressivity but this effect is not statistically significant.

Figure 1.6
Marginal effect of resource windfalls on Domestic tax per capita
as the level of structural progressivity increases



Notes: This figure shows the marginal effect of resource windfalls on domestic tax revenues per capita from equation (12). The marginal effect is computed for each increment of 0.001 in structural progressivity using estimation (8) from Table 1.6 . I compute the confidence interval using the standard error of the marginal effect which is: $\sqrt{var(\theta_1) + prog^2 * var(\theta_2) + 2 * prog * cov(\theta_1, \theta_2)}$.

Overall, the baseline results presented in Table 1.3 in addition to those in Table 1.6 show that evidently the "revenue curse" is a serious problem only in countries with low level of structural progressivity. The finding is consistent with the theoretical framework. The results suggest that progressive taxation dampens the so-called "revenue curse".

1.6 Robustness checks

I carry out various robustness checks. First, I employ tax revenues in percentage of GDP as an alternative measure for fiscal capacity to ensure a comparability with previous studies (Bornhorst *et al.*, 2009; Crivelli and Gupta, 2014 and James, 2015). Second, I show results of reduced forms estimates. I show estimations where the instrument and other covariates are regressed on domestic tax revenues. Indeed, while just identified instrumental variable estimates are median-unbiased the reduced forms are unbiased because they are OLS estimates (Angrist and Krueger, 2001). Third, because I do not have data on bauxite's international prices and on the export share of phosphate, I subtract bauxite and phosphate rents from the total rent to ensure that the results still hold. The fourth robustness check uses an alternative measurement of structural progressivity ($prog_2$). This alternative measure of structural progressivity allows to account for a potential nonlinear relationship between the tax rates and the level of income. The alternative measure may therefore allow me to account for the possibility of measurement error in $prog_1$.

Another robustness analysis consists in controlling for other institutional characteristics of the countries in the sample. This may explain the ability to effectively raise tax revenues and policy reforms such as progressive taxation as well. Peter et al (2010) argue that the structural progressivity measure favors causal inference and Figure 1.3 tends to support their claim. But controlling for the institutional framework may help ensure that the effect of progressive taxation is correctly identified and do not suffer from omitted variables bias. In another robustness check, I exclude countries with a potential market power and for which the violation of the exclusion restriction is likely. Tables 1.7 - 1.12 show the results and the structure of the tables is the same as before to allow comparison. [35]

[35] In Appendix , I provide the following additional robustness tests: testing the "revenue curse" hypothesis using other institutional controls; testing the conditional revenue curse hypothesis using alternative measures (total tax per capita and domestic tax in % of GDP); sample sensitivity analysis (dropping Oman and Iran, subsample analysis in low income and middle income countries, dropping countries with no rent over the period and finally dropping OPEC members), separating

Table 1.7
The revenue curse - Domestic tax in % GDP

Dependent variable: Domestic tax in % of GDP	OLS (1)	IV (2)	OLS (3)	IV (4)	OLS (5)	IV (6)	OLS (7)	IV (8)
Resource windfall	-0.112***	-0.230**	-0.118***	-0.247**	-0.120***	-0.245**	-0.116***	-0.236**
	(0.034)	(0.111)	(0.032)	(0.113)	(0.032)	(0.110)	(0.031)	(0.104)
GDP per capita (Log)			0.864	0.797	0.583	0.466	0.470	0.366
			(1.647)	(1.629)	(1.546)	(1.518)	(1.515)	(1.493)
Trade Openness (Log)			0.034**	0.035**	0.032**	0.033**	0.032**	0.032**
			(0.015)	(0.015)	(0.016)	(0.016)	(0.015)	(0.015)
Inflation (Log)			-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
			(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Aid (Log)			-0.018	-0.015	-0.019	-0.016	-0.021	-0.018
			(0.036)	(0.035)	(0.036)	(0.035)	(0.034)	(0.034)
Agriculture Value Added					-0.036	-0.043	-0.033	-0.040
					(0.062)	(0.061)	(0.062)	(0.061)
Corruption (0:Bad 6: Good)							0.398*	0.372*
							(0.230)	(0.224)
Observations	1054	1054	1054	1054	1054	1054	1054	1054
Countries	57	57	57	57	57	57	57	57
F Stat (first stage)		86.77		84.68		85.18		83.91

Notes: All specifications include year dummies and the within estimator is used to eliminate country fixed effects. Clustered standard errors at country level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

In a last robustness, I construct an alternative price index using 2000 as a reference year instead of 1995 as in the baseline. Table 1.7 shows results for testing the "revenue curse" hypothesis using the domestic tax in percentage of GDP. This alternative measure is used to ensure comparability with previous results. In column (4), a 1 percentage point increase in natural resource windfalls causes a reduction of 0.247 percentage point in domestic tax revenues. The interpretation of this result implies an offset of 24.7% (roughly 25%). Controlling for other determinants of tax revenues does not change much the result which is around 24%.The result is roughly the same as the one obtained by James (2015) on the US states. It is comprised between the 20% effect found by Bornhorst *et al.* (2009) and the 30% one found by Crivelli and Gupta (2014).

oil from other natural resources and specification controlling for the lag dependent variable. See Tables 1.15-1.28 and Figures 1.9, 1.10. I have tested also the effect of natural resources conditional on other characteristics of the personal income tax system which are the complexity and the top statutory rate. These tests show that progressivity is the only characteristic of the personal income tax system that matters. These results are not included but available upon request.

The corresponding effect for the conditional revenue curse is showed in Table 1.18 in Appendix . In column (4) of Table 1.18, at a progressivity level of 0.05 (corresponding to twice the sample average) an increase in the resource rent windfalls of $1 reduces domestic tax revenues by only $0.14. This level of progressive taxation dampens therefore the negative effect of natural resource windfalls by almost a half.

Table 1.8 shows estimates of reduced forms. For the "revenue curse", in column (1), a 1% growth in natural resource prices reduces domestic tax revenues per capita by 1.25%. For the conditional revenue curse, in column (8), the estimates show that at a structural progressivity equivalent to twice the sample average, a 1% increase in natural resource prices causes a reduction in domestic tax revenues per capita by 0.68%. This effect is similar to the one found in the baseline result.

Table 1.8
Reduced forms - The revenue curse & The conditional revenue curse

Dependent variable: Domestic tax per capita (Log)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Price growth	-1.251**	-1.632***	-1.272***	-1.883***	-1.274***	-1.878***	-1.203***	-1.794***
	(0.619)	(0.551)	(0.485)	(0.445)	(0.488)	(0.446)	(0.445)	(0.446)
Price growth × $Prog_1$		19.968**		23.078***		23.658***		22.334***
		(8.144)		(7.475)		(7.254)		(7.224)
$Prog_1$		-0.156		-0.133		-0.133		-0.213
		(1.617)		(1.291)		(1.282)		(1.287)
GDP per capita (Log)			1.070***	0.947***	1.066***	0.990***	1.058***	1.000***
			(0.136)	(0.135)	(0.143)	(0.150)	(0.139)	(0.146)
Trade Openness (Log)			0.232**	0.273**	0.231**	0.275**	0.218**	0.268**
			(0.101)	(0.118)	(0.100)	(0.117)	(0.098)	(0.116)
Inflation (Log)			-0.175***	-0.210	-0.175***	-0.214	-0.169***	-0.194
			(0.039)	(0.147)	(0.039)	(0.145)	(0.037)	(0.147)
AId (Log)			-0.347	-0.109	-0.349	-0.081	-0.367	-0.101
			(0.473)	(0.411)	(0.474)	(0.414)	(0.455)	(0.393)
Agriculture Value Added (Log)					-0.008	0.083	0.003	0.092
					(0.089)	(0.084)	(0.089)	(0.084)
Corruption (0: Bad 6: Good)							0.051***	0.039**
							(0.020)	(0.019)
Observations	1054	850	1054	850	1054	850	1054	850
Countries	57	57	57	57	57	57	57	57

Notes: All specifications include year dummies and the within estimator is used to eliminate country fixed effects. Clustered standard errors at country level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 1.9
The Conditional revenue curse - Subtracting bauxite and phosphate rents

Dependent variable: Domestic tax per capita (Log)	(1) OLS	(2) IV	(3) OLS	(4) IV	(5) OLS	(6) IV	(7) OLS	(8) IV
Resource windfall	-0.008***	-0.025***	-0.008***	-0.029***	-0.008***	-0.029***	-0.007***	-0.028***
	(0.003)	(0.008)	(0.003)	(0.007)	(0.003)	(0.007)	(0.003)	(0.007)
Resource windfall × $Prog_1$	0.158**	0.258**	0.126**	0.300***	0.129**	0.305***	0.130**	0.288***
	(0.068)	(0.108)	(0.055)	(0.108)	(0.053)	(0.107)	(0.056)	(0.106)
$Prog_1$	-0.154	-0.185	-0.159	-0.205	-0.158	-0.204	-0.235	-0.275
	(1.635)	(1.650)	(1.295)	(1.287)	(1.288)	(1.284)	(1.290)	(1.286)
GDP per capita (Log)			0.943***	0.938***	0.983***	0.957***	0.994***	0.968***
			(0.136)	(0.137)	(0.151)	(0.149)	(0.147)	(0.146)
Trade Openness (Log)			0.274**	0.290***	0.276**	0.291***	0.268**	0.284***
			(0.118)	(0.111)	(0.117)	(0.111)	(0.116)	(0.110)
Inflation (Log)			-0.204	-0.206	-0.208	-0.207	-0.188	-0.190
			(0.143)	(0.140)	(0.142)	(0.139)	(0.144)	(0.141)
Aid (Log)			-0.101	-0.038	-0.077	-0.027	-0.098	-0.046
			(0.415)	(0.404)	(0.418)	(0.405)	(0.398)	(0.387)
Agriculture Value Added (Log)					0.077	0.036	0.088	0.046
					(0.085)	(0.093)	(0.086)	(0.093)
Corruption (0: Bad 6:Good)							0.040**	0.036*
							(0.019)	(0.019)
Observations	850	850	850	850	850	850	850	850
Countries	57	57	57	57	57	57	57	57
F Stat (first stage): equation (1.13)		33.423		33.484		35.951		36.094
F Stat (first stage): equation (1.14)		65.971		64.018		70.819		69.855

Notes: All specifications include year dummies and the within estimator is used to eliminate country fixed effects. Clustered standard errors at country level in parentheses. In this table I subtract bauxite and phosphate rents from total resource rents as I do not have data on their respective prices and exports. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The remaining results are focused on the conditional revenue curse. Table 1.9 shows results for removing bauxite and phosphate rents from the total rent. The results are similar to the baseline results in terms of sign, magnitude and statistical significance. Overall, the results are not sensitive to excluding bauxite and phosphate from the natural resources. Table 1.10 shows the results for an alternative measure for structural progressivity ($Prog_2$).

Table 1.10 shows overall similar estimates to the baseline specification using Prog_1. The estimates in Column (8) imply that at a level of structural progressivity of 0.05, a 1% point increase in resource rents causes a reduction in domestic tax revenues per capita by 1.31%. This result is close to the baseline finding of 1.21%. It means that allowing for a potential nonlinear relationship between the tax rates and the levels of income does not change the fact that the "revenue curse" is conditional on progressive taxation.

Table 1.10
The conditional revenue curse - $Prog_2$

Dependent variable: Domestic tax per capita (Log)	OLS (1)	IV (2)	OLS (3)	IV (4)	OLS (5)	IV (6)	OLS (7)	IV (8)
Resource windfall	-0.007**	-0.022***	-0.008***	-0.029***	-0.008***	-0.029***	-0.007***	-0.027***
	(0.003)	(0.008)	(0.003)	(0.007)	(0.003)	(0.007)	(0.003)	(0.007)
Resource windfall × Prog_2	0.134**	0.196**	0.133***	0.301***	0.132***	0.301***	0.132***	0.279***
	(0.059)	(0.090)	(0.049)	(0.100)	(0.047)	(0.099)	(0.050)	(0.098)
Prog_2	-0.136	-0.163	0.043	-0.001	0.032	-0.004	-0.036	-0.065
	(1.190)	(1.209)	(0.983)	(0.981)	(0.970)	(0.977)	(0.991)	(0.995)
GDP per capita (Log)			0.945***	0.942***	0.983***	0.956***	0.994***	0.967***
			(0.137)	(0.138)	(0.152)	(0.150)	(0.148)	(0.147)
Trade Openness (Log)			0.273**	0.289***	0.276**	0.290***	0.268**	0.282**
			(0.117)	(0.111)	(0.117)	(0.111)	(0.115)	(0.110)
Inflation (Log)			-0.206	-0.208	-0.209	-0.209	-0.189	-0.192
			(0.144)	(0.141)	(0.143)	(0.140)	(0.145)	(0.143)
Aid (Log)			-0.103	-0.039	-0.080	-0.031	-0.102	-0.051
			(0.414)	(0.403)	(0.416)	(0.404)	(0.396)	(0.386)
Agriculture Value Added (Log)					0.074	0.028	0.085	0.039
					(0.085)	(0.094)	(0.085)	(0.094)
Corruption (0: Bad 6: Good)							0.040**	0.036*
							(0.019)	(0.019)
Observations	850	850	850	850	850	850	850	850
Countries	57	57	57	57	57	57	57	57
F Stat (first stage): equation (1.13)		30.76		31.20		33.89		34.01
F Stat (first stage): equation (1.14)		40.82		39.35		42.55		42.18

Notes: All specifications include year dummies and the within estimator is used to eliminate country fixed effects. Clustered standard errors at country level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 1.11 shows the results for using alternative controls for institutional characteristics of countries. The results in Table 1.11 are very similar to the baseline results. Besides, institutional variables do not have a statistically significant effect except for polity2. Indeed, since I use a within estimator and institutional variables are persistent, this was expected. The polity2 variable has a negative effect on domestic tax revenues per capita suggesting that democratic countries may tax less. The result can have an explanation in the political budget cycle in taxation that may take place in democratic countries. The results also suggest overall that controlling for institutions does not change the baseline result.

Table 1.12 shows the results for excluding countries with a potential market power. I exclude from these estimations, countries in the sample that are major exporters for each of the 13 natural resources, when this information is available.[36] The countries that are excluded are: Chile, China, Indonesia and Morocco. Chile is the world's largest exporter of copper. Indonesia and China are among the top 3 exporting countries of coal (behind Australia) in 2003. Finally, Indonesia is the world's leading exporter of tin and Morocco is the world's largest exporter of phosphates. These 4 countries could influence the prices of natural resources that they export as leaders. If these countries have a market power, the instrument can no longer be considered as exogenous. Table 1.12 shows that the results are robust to the exclusion of these 4 countries.

[36]The relevant information are in Table 1.24 in Appendix.

Table 1.11
The conditional revenue curse - Institutional controls

Dependent variable: Domestic tax per capita (Log)	OLS (1)	IV (2)	OLS (3)	IV (4)	OLS (5)	IV (6)	OLS (7)	IV (8)
Resource windfall	-0.007***	-0.029***	-0.008***	-0.029***	-0.007***	-0.029***	-0.008***	-0.027***
	(0.003)	(0.007)	(0.003)	(0.007)	(0.003)	(0.007)	(0.003)	(0.006)
Resource windfall × $Prog_1$	0.120**	0.310***	0.125**	0.301***	0.119**	0.294***	0.122**	0.291***
	(0.051)	(0.109)	(0.055)	(0.109)	(0.053)	(0.107)	(0.051)	(0.104)
$Prog_1$	-0.121	-0.170	-0.051	-0.098	-0.159	-0.205	-0.182	-0.222
	(1.291)	(1.286)	(1.259)	(1.258)	(1.294)	(1.291)	(1.313)	(1.310)
GDP per capita (Log)	0.978***	0.956***	0.960***	0.935***	0.986***	0.960***	0.972***	0.948***
	(0.147)	(0.146)	(0.142)	(0.141)	(0.146)	(0.145)	(0.150)	(0.148)
Trade Openness (Log)	0.276**	0.291***	0.263**	0.276**	0.271**	0.285**	0.286**	0.299***
	(0.117)	(0.110)	(0.120)	(0.114)	(0.117)	(0.112)	(0.118)	(0.113)
Inflation (Log)	-0.206	-0.206	-0.197	-0.197	-0.200	-0.201	-0.203	-0.202
	(0.141)	(0.139)	(0.136)	(0.133)	(0.146)	(0.143)	(0.137)	(0.135)
Agriculture Value Added (Log)	0.075	0.033	0.084	0.042	0.077	0.035	0.090	0.053
	(0.084)	(0.093)	(0.088)	(0.095)	(0.086)	(0.093)	(0.083)	(0.090)
Aid (Log)	-0.072	-0.020	-0.113	-0.061	-0.080	-0.027	0.013	0.064
	(0.417)	(0.405)	(0.404)	(0.391)	(0.426)	(0.413)	(0.378)	(0.367)
Internal conflict	-0.030	-0.017						
	(0.048)	(0.047)						
External conflict	0.023	0.029						
	(0.083)	(0.072)						
Bureaucracy quality			0.029	0.028				
			(0.032)	(0.031)				
Democratic accountability					0.013	0.013		
					(0.020)	(0.020)		
Polity2							-0.009*	-0.009**
							(0.004)	(0.004)
Observations	850	850	850	850	850	850	850	850
Countries	57	57	57	57	57	57	57	57
F Stat (first stage): equation (1.13)		35.90		36.20		36.70		38.06
F Stat (first stage): equation (1.14)		71.90		71.40		71.72		72.81

Notes: All specifications include year dummies and the within estimator is used to eliminate country fixed effects. Clustered standard errors at country level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 1.12
The Conditional revenue curse - Excluding countries with market power

Dependent variable: Domestic tax per capita (Log)	(1) OLS	(2) IV	(3) OLS	(4) IV	(5) OLS	(6) IV	(7) OLS	(8) IV
Resource windfall	-0.008***	-0.023***	-0.007***	-0.025***	-0.007**	-0.025***	-0.007**	-0.023***
	(0.003)	(0.008)	(0.003)	(0.006)	(0.003)	(0.007)	(0.003)	(0.006)
Resource windfall $\times$ $Prog_1$	0.148**	0.234**	0.107**	0.258**	0.113**	0.266**	0.114**	0.246**
	(0.063)	(0.107)	(0.054)	(0.107)	(0.053)	(0.106)	(0.055)	(0.104)
$Prog_1$	-0.376	-0.410	-0.171	-0.213	-0.164	-0.207	-0.287	-0.321
	(1.663)	(1.675)	(1.303)	(1.299)	(1.293)	(1.292)	(1.291)	(1.291)
GDP per capita (Log)			1.082***	1.070***	1.144***	1.110***	1.150***	1.117***
			(0.146)	(0.147)	(0.168)	(0.165)	(0.170)	(0.167)
Trade Openness (Log)			0.263**	0.276**	0.265**	0.277**	0.258**	0.269**
			(0.123)	(0.117)	(0.122)	(0.117)	(0.120)	(0.115)
Inflation (Log)			-0.185	-0.188	-0.189	-0.190	-0.166	-0.170
			(0.141)	(0.139)	(0.139)	(0.137)	(0.142)	(0.140)
Aid(Log)			-0.018	0.032	0.016	0.053	-0.017	0.022
			(0.426)	(0.417)	(0.431)	(0.420)	(0.410)	(0.402)
Agriculture Vale Added (Log)					0.105	0.068	0.113	0.076
					(0.090)	(0.098)	(0.091)	(0.097)
Corruption (0: Bad 6: Good)							0.042*	0.039*
							(0.022)	(0.022)
Observations	786	786	786	786	786	786	786	786
Countries	53	53	53	53	53	53	53	53
F Stat (first stage): equation (1.13)		30.68		29.75		32.16		31.97
F Stat (first stage): equation (1.14)		64.34		61.81		69.02		67.78

Notes: All specifications include year dummies and the within estimator is used to eliminate country fixed effects. Clustered standard errors at country level in parentheses. The countries dropped are Chile (copper), China (coal), Indonesia (coal, Tin) and Morocco (Phosphate).
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Finally Table 1.13 shows the result for an alternative price index as instrument. The estimates in Column (2) imply that at a level of structural progressivity equivalent to twice the sample average, a 1 percentage point increase in resource windfalls causes a reduction in domestic tax revenues per capita by only 1.78%. As shown in Table 1.28, the corresponding effect for the revenue curse is a 3.2% reduction in tax revenues per capita. Overall Table 1.12 and Table 1.13 show similar results to the baseline.

Table 1.13
The Conditional revenue curse - Robustness using a different price index

Dependent variable: Domestic tax per capita (Log)	(1) OLS	(2) IV	(3) OLS	(4) IV	(5) OLS	(6) IV	(7) OLS	(8) IV
Resource windfall	-0.008***	-0.029***	-0.008***	-0.029***	-0.008***	-0.029***	-0.007***	-0.027***
	(0.003)	(0.010)	(0.003)	(0.007)	(0.003)	(0.007)	(0.003)	(0.007)
Resource windfall × $Prog_1$	0.147**	0.223*	0.118**	0.272**	0.122**	0.277***	0.122**	0.259**
	(0.065)	(0.123)	(0.053)	(0.106)	(0.052)	(0.106)	(0.054)	(0.103)
$Prog_1$	-0.155	-0.221	-0.160	-0.214	-0.159	-0.213	-0.236	-0.283
	(1.637)	(1.656)	(1.296)	(1.291)	(1.289)	(1.288)	(1.291)	(1.290)
GDP per capita (Log)			0.943***	0.939***	0.983***	0.956***	0.994***	0.967***
			(0.136)	(0.137)	(0.151)	(0.149)	(0.147)	(0.146)
Trade Openness (Log)			0.274**	0.289***	0.276**	0.290***	0.268**	0.282**
			(0.118)	(0.111)	(0.117)	(0.111)	(0.116)	(0.110)
Inflation (Log)			-0.205	-0.207	-0.208	-0.208	-0.188	-0.191
			(0.143)	(0.140)	(0.141)	(0.139)	(0.144)	(0.141)
Aid (Log)			-0.100	-0.032	-0.076	-0.022	-0.098	-0.043
			(0.415)	(0.403)	(0.418)	(0.404)	(0.398)	(0.386)
Agriculture Value Added (Log)					0.077	0.033	0.087	0.045
					(0.085)	(0.095)	(0.086)	(0.094)
Corruption (0:Bad 6: Good)							0.040**	0.036*
							(0.019)	(0.019)
Observations	850	850	850	850	850	850	850	850
Countries	57	57	57	57	57	57	57	57
F Stat (first stage): equation (1.13)		27.474		28.522		28.229		27.980
F Stat (first stage): equation (1.14)		40.87		43.03		43.52		43.08

Notes: All specifications include year dummies and the within estimator is used to eliminate country fixed effects. Clustered standard errors at country level in parentheses. In this table, I use a price index with 2000 as the base year. In addition, the time-invariant export share of a given resource is the ratio of this resource's export over the total export of the country in 2000. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

1.7 Other Potential channels

In this chapter, the theoretical analysis of the "revenue curse" is focused on the incentive problem faced by governments in resource-rich countries as they tend to have weak incentives to implement and sustain efficient tax systems (Knack, 2009). The theoretical framework underlines therefore the mitigating effect of progressive taxation through its impact on government incentives to invest in fiscal capacity.

However, progressive taxation may operate through other channels to dampen the "revenue curse". For instance, there are microeconomic studies (Doerrenberg and Peichl, 2013; OECD, 2013; Daude *et al.*, 2013; and Heinemann and Kocher, 2013) showing that progressive taxation has a positive effect on tax morale. Tax morale can be defined as the voluntary compliance with tax laws.[37] The idea is that progressive taxation may send a signal about the fairness of the tax system. Using a worldwide sample based on individual level data from public opinion surveys, OECD (2013) shows that citizens who think of fiscal redistribution as an essential characteristic of a democracy tend to have a higher tax morale. Daude *et al.* (2013) find the same result in a sample of developing countries. In the same vein, Doerrenberg and Peichl (2013) show in a theoretical framework with inequality averse individuals that increased progressivity may favour tax morale. Their empirical results using microeconomic level data on 19 OECD countries are consistent with this theoretical model. Also, Heinemann and Kocher (2013) using an experimental approach show that tax compliance is higher under progressive taxation than in proportionate taxation. The difference in the progressivity of the tax system could therefore capture a difference in the degree of tax compliance. In other words, tax evasion may be low in countries with a high degree of progressive taxation as suggested by Heinemann and Kocher (2013).

[37] Luttmer and Singhal (2014) report examples from India and Kenya about the valuation of tax morale by local tax administration authorities as a mean to collect tax revenues.

Although the theoretical framework does not account (directly) for tax evasion, there is a potential link with the microeconomic literature on the effect of progressive taxation on tax morale. Indeed, investing in fiscal capacity is necessary to curb tax evasion. But, the cost of this investment is likely to be high if tax evasion is pervasive in the country. Thus, a high tax morale or tax compliance in countries with progressive taxation may make an investment in fiscal capacity less costly. Progressive taxation may therefore reduce the cost of investment in fiscal capacity and may help dampen the so-called "revenue curse" by increasing tax compliance.

Finally, progressive taxation may also dampen the "revenue curse" by enhancing automatic stabilizers. Baunsgaard and Symansky (2009) argue that increasing the progressivity of the personal income tax may reinforce the automatic stabilizers. Indeed, a progressive income tax makes tax revenues more responsive to the economic cycle. The economic cycle in resource-rich countries is likely to be mostly sensitive to the changes in the resource sector. Thus, progressive income taxation may help collect more tax revenues in resource-rich countries following a resource boom.

1.8 Conclusion

Tax revenues collection is crucial for economic development. The recent collapse in oil prices (from June 2014 to the end of February 2016) and its detrimental effect on public revenues in some oil dependent countries reinforces the importance of tax revenues collection. This chapter analyzes the role of progressive taxation in increasing tax revenues collection in developing countries that are rich in natural resources. I incorporate a progressive income taxation in a theoretical framework where a government in a resource-rich country, faces the incentive problem of whether to undertake a costly investment in its own ability to collect tax revenues. The model predicts that a resource-rich country with a progressive income tax has more incentives to invest in its fiscal capacity. The mechanism is that the progressive tax system allows the government to collect more taxes (on high incomes). In

addition, I estimate the causal impact of natural resource rent windfalls on domestic tax revenues collection. I find that consistently with the theoretical model this effect is conditional on the degree of progressive taxation. The results suggest some policy implications in order to help resource rich countries increase tax revenues.

The empirical assessment of the effect of natural resources on domestic tax revenues is difficult because of the potential endogeneity of natural resource rents. The empirical strategy in this chapter exploits the plausibly exogenous variation in international prices of natural resources at the country level in order to isolate the causal impact of natural resource rents on domestic tax revenues. I use a macroeconomic panel dataset on 57 developing countries over the period 1981-2005. I find that there is a partial substitution of 25% between natural resource rent windfalls and domestic tax revenues. However, progressive taxation dampens the detrimental effect of natural resources on domestic tax revenues. At a progressivity level equivalent to twice the sample average, an increase in the resource rent windfalls of $1 reduces domestic tax revenues by only $0.14.

These results suggest that policy reforms aimed at strengthening progressive taxation may help resource-rich countries to enhance their fiscal capacity. The theoretical model suggests that the change in the incentive of governments is a potential channel through which progressive taxation may operate to dampen the so-called “revenue curse”. However, other potential channels (tax morale and automatic stabilizers) may be at work as well. While there is a growing research on the effect of natural resources on fiscal capacity, this chapter, to the best of my knowledge, is the first to show that progressive taxation dampens the “revenue curse”. Conversely to the idea that progressive taxation may have a negative economic impact, this chapter suggests that it may also have positive effects. In addition to a theoretical model, the chapter employs a novel instrumental variable to deal with the endogeneity of natural resource rents. The chapter suggests a future avenue for research related to how the design of the tax policy may influence tax policy effectiveness.

1.9 Appendix Chapter 1

The Appendix has two main sub-sections : the first focusing on a more complex version of the theoretical framework than the one presented earlier and the second focusing on the empirics.

1.9.1 Appendix A: Theoretical framework

Assuming a convex cost function

By the implicit function theorem,

$$\frac{\partial \tau_2}{\partial R} = -\frac{\partial Q/\partial R}{\partial Q/\partial \tau_2} \tag{1.15}$$

$$\frac{\partial Q}{\partial R} = \phi \alpha_2 \left(\theta_I W_I^{\sigma} + \theta_O W_O^{\sigma}\right) V_{G_2 G_2} \left[\tau_2 \left(\theta_I W_I^{\sigma} + \theta_O W_O^{\sigma}\right) + R\right]$$

$$\frac{\partial Q}{\partial \tau_2} = \phi \alpha_2 \left(\theta_I W_I^{\sigma} + \theta_O W_O^{\sigma}\right)^2 V_{G_2 G_2} \left[\tau_2 \left(\theta_I W_I^{\sigma} + \theta_O W_O^{\sigma}\right) + R\right] - \lambda_1 F_{\tau_2 \tau_2}(\tau_2 - \tau_1) \tag{1.16}$$

Equations (16) implies that

$$\frac{\partial \tau_2}{\partial R} = -\left\{ \frac{\phi \alpha_2 \left(\theta_I W_I^{\sigma} + \theta_O W_O^{\sigma}\right) V_{G_2 G_2} \left[\tau_2 \left(\theta_I W_I^{\sigma} + \theta_O W_O^{\sigma}\right) + R\right]}{\phi \alpha_2 \left(\theta_I W_I^{\sigma} + \theta_O W_O^{\sigma}\right)^2 V_{G_2 G_2} \left[\tau_2 \left(\theta_I W_I^{\sigma} + \theta_O W_O^{\sigma}\right) + R\right] - \lambda_1 F_{\tau_2 \tau_2}(\tau_2 - \tau_1)} \right\} < 0 \tag{1.17}$$

The sign of the derivative (17) comes from the properties of $V(\cdot)$ and $F(\cdot)$. The numerator and the denominator of (17) have the same sign. The derivative in equation (17) shows the so-called "revenue curse" : higher natural resource rents lead to a lower investment in fiscal capacity. The government has two sources of benefit

from an investment in fiscal capacity: tax revenues and the public good. Recall that the government's objective is to maximize its own group utility (which depends on public good) and tax revenues. Again, by the properties of $V(\cdot)$, the consumption of public goods is characterized by a diminishing marginal utility. In addition, the properties of $F(\cdot)$ implies an increasing marginal cost of investment in fiscal capacity.

The intuitions for the "revenue curse" follow Cárdenas *et al.* (2011). Consider a scenario in which the world is in the common interest state at $s = 2$. The economy is characterized by a high valuation of public goods. The incumbent government uses its revenue to provide for public goods. The intuition for the "revenue curse" is the following. When natural resource rents are high and given the properties of $V(\cdot)$ and $F(\cdot)$, the government has less incentives in undertaking a costly investment because rents can be used to finance public goods' production without any cost. In a scenario where the world is in the redistributive state in $s = 2$, since public goods are not valuable, the incumbent government will redistribute all the available revenue to its own group for private consumption. The intuition for the "revenue curse" is the following. Because of the uncertainty about remaining in power, the incumbent has less incentives to invest in fiscal capacity because its group will be taxed at a higher rate if he looses power. The incumbent government prefers to increase private consumption of its own group by redistribution of the increased natural resource rents. This choice is preferred over investing in fiscal capacity which may become a burden for the group in power if they loose power in the second period.

Proposition: Progressive taxation mitigates the "revenue curse" because returns to the investment in fiscal capacity are higher with progressive taxation.

The proof of this proposition consists in finding the condition for $\dfrac{\partial \tau_2}{\partial R \partial \sigma} > 0$

$$\frac{\partial \tau_2}{\partial R \partial \sigma} = -\left\{ \frac{\phi \alpha_2 \left(\theta_I W_I^{\sigma} lnW_I + \theta_O W_O^{\sigma}\ lnW_O\right) V_{G_2G_2} \left[-\phi \alpha_2 \left(\theta_I W_I^{\sigma} + \theta_O W_O^{\sigma}\right)^2 V_{G_2G_2} - \lambda_1 F_{\tau_2\tau_2}(\tau_2 - \tau_1) \right]}{\left\{ \phi \alpha_2 \left(\theta_I W_I^{\sigma} + \theta_O W_O^{\sigma}\right)^2 V_{G_2G_2} - \lambda_1 F_{\tau_2\tau_2}(\tau_2 - \tau_1) \right\}^2} \right\} \tag{1.18}$$

In equation (18),

$$\frac{\partial \tau_2}{\partial R \partial \sigma} > 0 \text{ if } \phi \alpha_2 \left(\theta_I W_I^{\sigma} + \theta_O W_O^{\sigma}\right)^2 |V_{G_2G_2}| > \lambda_1 F_{\tau_2\tau_2}(\tau_2 - \tau_1) \tag{1.19}$$

The highest possible value of λ_1 which is the realized value of government funds in period 1 is attained in the "common interest state" and it is equal to $\alpha_H V_G(G_1)$, that is the marginal utility of public good consumption. The term $\left(\theta_I W_I^{\sigma} + \theta_O W_O^{\sigma}\right)$ represents the tax base which is higher than the aggregated payroll in the economy because $\sigma > 1$ (and W $\ggg$ 1). (19) gives some intuition about the explanation of the conditional revenue curse. The returns to the investment in fiscal capacity are higher the more progressive is the tax system. To see this, Consider the extreme cases of a country A characterized by a linear taxation and a country B by progressive taxation and assume that the two countries have the same tax rates and the same cost function for investment in fiscal capacity. It is easy to see that country B will raise more tax revenues than country A because equation (19) is more likely to hold. The country with progressive taxation has more incentives to invest in fiscal capacity because returns to the investment in fiscal capacity, namely the amount of tax revenues raised, is higher than in the country with linear taxation. The expected high tax revenues may also allow the government to cover the costs of this investment.

Consider now a scenario in which the world is in the common interest state at $s = 2$. The conditional revenue curse can be explained by the fact that in the common interest state, nonlinear taxation relaxes the government's constraint by generating additional revenues. More specifically, the increase in tax revenues coming from the nonlinear tax schedule may compensate for the fact that the marginal cost is increasing and the marginal benefit from public good consumption is decreasing. To see this, note that in equation (19), $V_{G_2G_2}$ and $F_{\tau_2\tau_2}$ capture respectively the concavity of $V(\cdot)$ (utility of public good) and the convexity of $F(\cdot)$ (cost of investment in fiscal capacity). Finally, in a scenario where the world is in the redistributive state in $s = 2$, since public goods are not valuable, again, the incumbent government will redistribute all the available revenue to its own group for private consumption. The explanation for the conditional revenue curse comes from the fact that with the progressive tax schedule it is possible for the incumbent group to increase its own group consumption because of the tax collected on high incomes. This incentive to invest in fiscal capacity is obviously increasing in the probability of being in power.

Expected payoff

This Appendix shows the details regarding the calculation of the expected payoff. Assuming that the group I_1 stays in power in $s = 2$, its utility is given by:

$$U_{I2} = \begin{cases} A = \alpha_2 V\left[\tau_2(\theta_I W_I^{\sigma} + \theta_O W_O^{\sigma}) + R\right] + W_I - \tau_2 W_I^{\sigma} \text{ (in the common interest state)} \\ B = W_I - \theta_I t_{I2} W_I^{\sigma} = W_I + \theta_O \tau_2 W_O^{\sigma} + R \quad \text{(in the redistributive state)} \end{cases}$$

The second period's payoff can be written as $\eta_{I2} = \phi A + (1-\phi)B$. Where ϕ and $(1-\phi)$ are respectively the probability of being in the common interest state and the redistributive state. If the opposition wins in the process of political transition in the second period, the expected payoff is given by:

$$U_{O2} = \begin{cases} A' = \alpha_2 V\left[\tau_2(\theta_I W_I^{\sigma} + \theta_O W_O^{\sigma}) + R\right] + W_O - \tau_2 W_O^{\sigma} \text{ (in the common interest state)} \\ B' = W_O - \theta_O t_{O2} W_O^{\sigma} = W_O + \theta_I \tau_2 W_I^{\sigma} + R \quad \text{(in the redistributive state)} \end{cases}$$

Therefore, the second period's expected payoff when the opposition is in power is given by $\eta_{O2} = \phi A^{'} + (1-\phi)B^{'}$. Finally the second period's payoff (net of the cost of investment in fiscal capacity) can be written as: $\eta = \gamma\eta_{I2} + (1-\gamma)\eta_{O2} - \lambda_1 F(\tau_2 - \tau_1)$. Where γ is the probability of staying in power.

The (ambiguous) direct effect of progressivity on investment in fiscal capacity
By the implicit function theorem,

$$\frac{\partial \tau_2}{\partial \sigma} = -\frac{\partial Q/\partial \sigma}{\partial Q/\partial \tau_2}$$

$$\frac{\partial \tau_2}{\partial \sigma} = -\left\{ \frac{\kappa + W_I^{\sigma} lnW_I(-\gamma\phi + (1-\gamma)(1-\phi)\theta_I) + W_O^{\sigma} lnW_O[\gamma(1-\phi)\theta_O - (1-\gamma)\phi]}{\phi\alpha_2 \left(\theta_I W_I^{\sigma} + \theta_O W_O^{\sigma}\right)^2 V_{G_2G_2} - \lambda_1 F_{\tau_2\tau_2}(\tau_2 - \tau_1)} \right\}$$

$$\text{with } \kappa = \phi\alpha_2 \left(\theta_I W_I^{\sigma} + \theta_O W_O^{\sigma}\right)[V_{G_2} + \tau_2(\theta_I W_I^{\sigma} + \theta_O W_O^{\sigma})V_{G_2G_2}]$$

The denominator has a negative sign coming from the properties of $F(\cdot)$ and $V(\cdot)$. The sign of the numerator is ambiguous because it depends on the values of the exogenous parameters (γ, ϕ, θ_0 and θ_I) and includes also the summation of two terms of opposite sign (in κ).

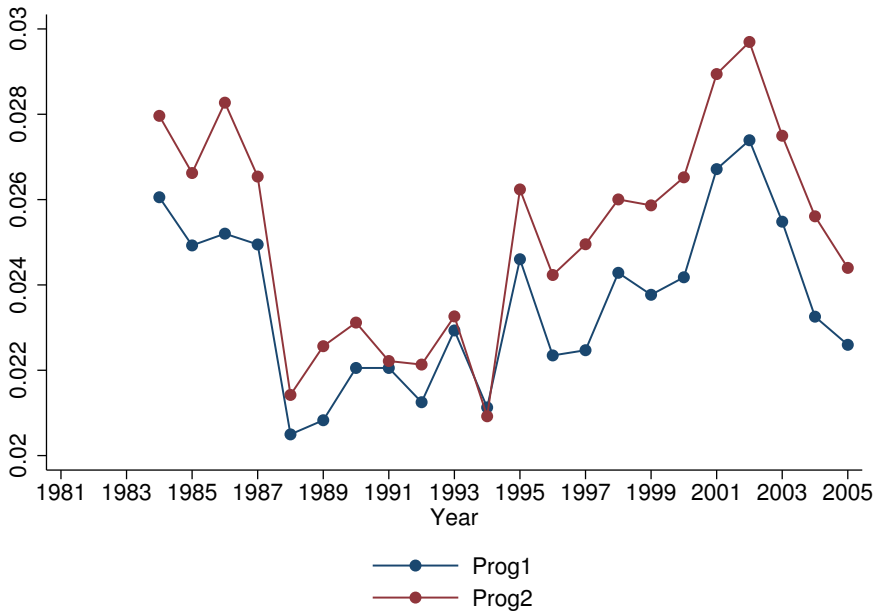
1.9.2 Appendix B: Empirical Analysis

Countries in the sample Algeria, Argentina, Bahrain, Bangladesh, Bolivia, Botswana, Cameroon, Chile, China, Rep.of Congo, Costa Rica, Côte d'Ivoire, Dominican Republic, Ecuador, Egypt, El Salvador, Ethiopia, Gabon, Gambia, Ghana, Guatemala, Guyana, Haiti, Honduras, India, Indonesia, Iran, Jamaica, Kenya, Madagascar, Malawi,

Malaysia, Mali, Morocco, Mozambique, Niger, Nigeria, Oman, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Senegal, South Africa, Sri Lanka, Syria, Tanzania, Thailand, Togo, Trinidad and Tobago, Tunisia, Uganda, Uruguay, Zambia, Zimbabwe.

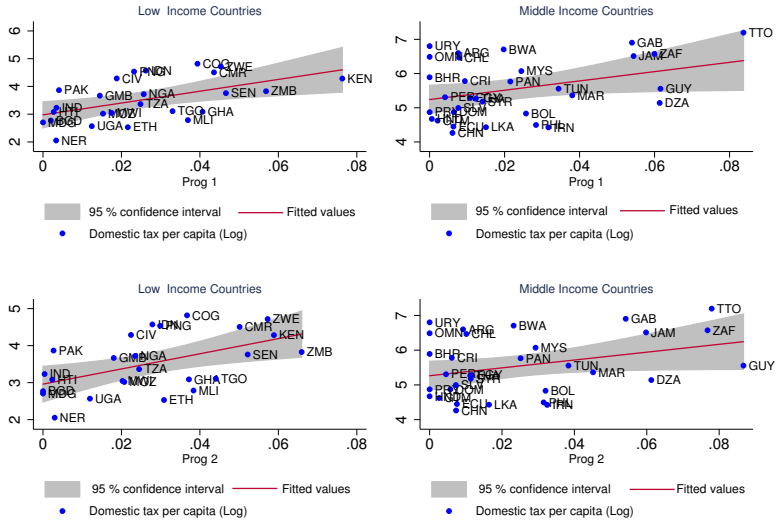
Appendix B - Figures

Figure 1.7
Trend in structural progressivity in the sample



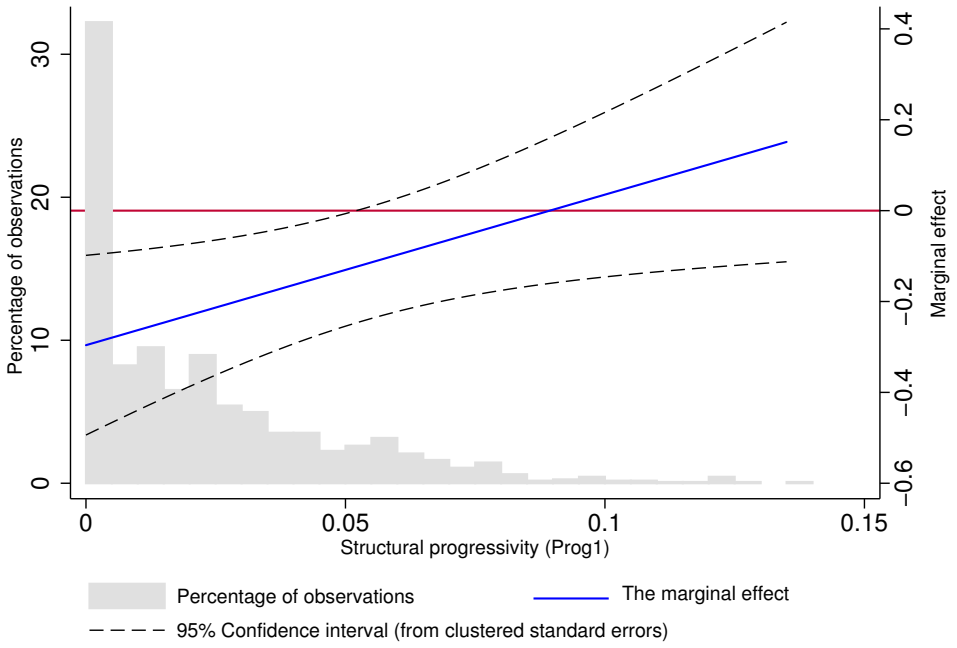
Notes: This figure shows the unweighted trend in structural progressivity in the sample. Prog1 is a measure of structural progressivity assuming a linear relationship between the rates and the levels of income. Prog2 measures the structural progressivity focusing on the middle portion of the income distribution and allows to account for the possibility of a non linear relationship between the rates and the levels of income.

Figure 1.8
Correlation between Domestic tax per capita and structural progressivity



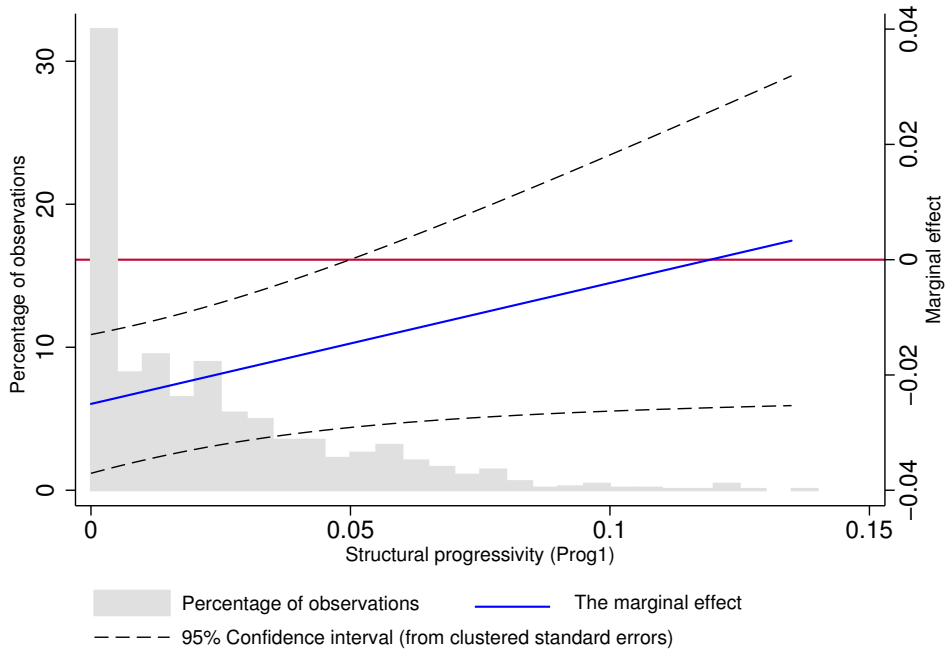
Notes: Prog1 is a measure of structural progressivity assuming a linear relationship between the rates and the levels of income. Prog2 measures the structural progressivity focusing on the middle portion of the income distribution and allows to account for the possibility of a non linear relationship between the rates and the levels of income.

Figure 1.9
Marginal effect of resource windfalls on Domestic tax in % of GDP
as the level of structural progressivity increases



Notes: This figure shows the marginal effect of resource windfalls on domestic tax revenues in % of GDP from equation (12). The marginal effect is computed for each increment of 0.001 in structural progressivity using estimation (8) from Table 1.18. I compute the confidence interval using the standard error of the marginal effect which is: $\sqrt{var(\theta_1) + prog^2 * var(\theta_2) + 2 * prog * cov(\theta_1, \theta_2)}$.

Figure 1.10
Marginal effect of Oil windfalls on Domestic tax per capita
as the level of structural progressivity increases



Notes: This figure shows the marginal effect of resource windfalls on domestic tax revenues per capita from equation (12). The marginal effect is computed for each increment of 0.001 in structural progressivity using estimation (8) from Table 1.26. I compute the confidence interval using the standard error of the marginal effect which is: $\sqrt{var(\theta_1) + prog^2 * var(\theta_2) + 2 * prog * cov(\theta_1, \theta_2)}$.

Appendix B - Tables

Table 1.14
Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Total resource windfall	1054	0.077	3.416	-26.16	23.483
Oil windfall	931	-0.058	3.028	-26.337	22.392
Other resource windfall	931	0.12	1.509	-8.431	15.758
Domestic tax per capita (Log)	1054	4.617	1.306	1.305	7.859
Total tax per capita (Log)	1054	4.871	1.227	2.158	7.919
Domestic tax (% of GDP)	1054	12.572	5.964	1.708	37.131
Price growth (all resources)	1054	0.002	0.025	-0.148	0.239
Price growth (other resources)	1054	0.001	0.02	-0.108	0.215
Price growth (oil)	1054	0.001	0.015	-0.149	0.114
Agriculture Value Added (Log)	1054	2.87	0.749	-0.161	4.232
Aid (Log)	1054	4.663	0.076	4.6	5.2
GDP per capita (Log)	1054	6.804	1.09	4.523	9.344
Trade Openness(Log)	1054	4.068	0.518	2.513	5.395
Inflation (Log)	1054	4.757	0.33	4.481	9.38
Corruption	1054	2.697	0.945	0	5
$Prog_1$	850	0.024	0.025	0	0.136
$Prog_2$	850	0.025	0.027	0	0.131
Internal conflict	1054	0.208	0.406	0	1
External conflict	1054	0.027	0.161	0	1
Bureaucracy quality	1054	1.714	0.923	0	4
Democratic accountability	1054	3.209	1.188	0	6
Polity2	1054	1.249	6.559	-10	10

Table 1.15
The revenue curse - Institutional Controls

Dependent variable: Domestic tax per capita (Log)	OLS (1)	IV (2)	OLS (3)	IV (4)	OLS (5)	IV (6)	OLS (7)	IV (8)
Resource windfall	-0.008***	-0.025**	-0.009***	-0.026**	-0.008***	-0.026**	-0.008***	-0.025**
	(0.002)	(0.010)	(0.002)	(0.011)	(0.002)	(0.011)	(0.002)	(0.010)
GDP per capita (Log)	1.047***	1.022***	1.024***	0.993***	1.061***	1.030***	1.045***	1.017***
	(0.140)	(0.137)	(0.139)	(0.133)	(0.140)	(0.135)	(0.145)	(0.139)
Trade Openness (Log)	0.228**	0.230**	0.212**	0.212**	0.221**	0.222**	0.242**	0.243**
	(0.098)	(0.096)	(0.100)	(0.098)	(0.100)	(0.098)	(0.100)	(0.098)
Inflation (Log)	-0.170***	-0.175***	-0.167***	-0.172***	-0.171***	-0.177***	-0.162***	-0.167***
	(0.037)	(0.035)	(0.034)	(0.032)	(0.037)	(0.035)	(0.037)	(0.034)
Agriculture Value Added (Log)	-0.025	-0.065	-0.015	-0.056	-0.023	-0.063	-0.014	-0.052
	(0.090)	(0.099)	(0.092)	(0.100)	(0.090)	(0.099)	(0.090)	(0.099)
Aid (Log)	-0.308	-0.257	-0.375	-0.316	-0.335	-0.276	-0.223	-0.167
	(0.473)	(0.460)	(0.439)	(0.427)	(0.483)	(0.470)	(0.405)	(0.396)
Internal conflict	-0.076	-0.058						
	(0.051)	(0.046)						
External conflict	0.033	0.040						
	(0.094)	(0.088)						
Bureaucracy quality			0.036	0.037				
			(0.028)	(0.028)				
Democratic_accountability					0.015	0.014		
					(0.017)	(0.017)		
Polity2							-0.009**	-0.009**
							(0.004)	(0.004)
Observations	1054	1054	1054	1054	1054	1054	1054	1054
Countries	57	57	57	57	57	57	57	57
F Stat (first stage)		82.99		90.25		91.31		91.60

Notes: All specifications include year dummies and the within estimator is used to eliminate country fixed effects. Clustered standard errors at country level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 1.16
The revenue curse: Excluding countries with market power

Dependent variable: Domestic tax per capita (Log)	(1) OLS	(2) IV	(3) OLS	(4) IV	(5) OLS	(6) IV	(7) OLS	(8) IV
Resource windfall	-0.009***	-0.025*	-0.008***	-0.024**	-0.008***	-0.025**	-0.008***	-0.023**
	(0.003)	(0.014)	(0.002)	(0.011)	(0.002)	(0.011)	(0.002)	(0.010)
GDP per capita (Log)			1.188***	1.174***	1.185***	1.148***	1.174***	1.140***
			(0.151)	(0.147)	(0.160)	(0.153)	(0.160)	(0.154)
Trade Openness (Log)			0.215**	0.217**	0.215**	0.215**	0.201**	0.203**
			(0.104)	(0.102)	(0.104)	(0.102)	(0.102)	(0.101)
Inflation (Log)			-0.165***	-0.171***	-0.165***	-0.171***	-0.159***	-0.164***
			(0.036)	(0.034)	(0.036)	(0.034)	(0.035)	(0.033)
Aid (Log)			-0.259	-0.201	-0.260	-0.208	-0.287	-0.236
			(0.492)	(0.483)	(0.494)	(0.483)	(0.474)	(0.465)
Agriculture Value Added (Log)					-0.005	-0.045	0.008	-0.031
					(0.096)	(0.107)	(0.097)	(0.104)
Corruption (0:Bad 6:Good)							0.054**	0.050**
							(0.023)	(0.022)
Observations	976	976	976	976	976	976	976	976
Countries	53	53	53	53	53	53	53	53
F Stat (first stage)		74.53		72.34		77.85		76.05

Notes: All specifications include year dummies and the within estimator is used to eliminate country fixed effects. Clustered standard errors at country level in parentheses. The countries dropped are Chile (Copper), China (Coal), Indonesia (Coal,Tin) and Morocco (Phosphate). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 1.17
The Conditional revenue curse - Total tax per capita

Dependent variable: Total tax per capita (Log)	OLS (1)	IV (2)	OLS (3)	IV (4)	OLS (5)	IV (6)	OLS (7)	IV (8)
Resource windfall	-0.007***	-0.019***	-0.007***	-0.022***	-0.007***	-0.022***	-0.007***	-0.022***
	(0.003)	(0.007)	(0.002)	(0.005)	(0.002)	(0.005)	(0.002)	(0.005)
Resource windfall $\times$ $Prog_1$	0.122**	0.146**	0.108**	0.195***	0.109**	0.192***	0.109**	0.181***
	(0.062)	(0.072)	(0.049)	(0.066)	(0.050)	(0.066)	(0.051)	(0.064)
$Prog_1$	0.208	0.164	0.053	0.004	0.053	0.003	0.006	-0.040
	(1.291)	(1.301)	(0.899)	(0.893)	(0.899)	(0.894)	(0.900)	(0.896)
GDP per capita (Log)			0.896***	0.893***	0.900***	0.879***	0.907***	0.886***
			(0.113)	(0.115)	(0.128)	(0.128)	(0.127)	(0.127)
Trade Openness (Log)			0.306***	0.316***	0.306***	0.315***	0.301***	0.311***
			(0.094)	(0.090)	(0.094)	(0.090)	(0.093)	(0.089)
Inflation (Log)			-0.123	-0.126	-0.123	-0.125	-0.111	-0.114
			(0.081)	(0.079)	(0.081)	(0.079)	(0.083)	(0.081)
Aid (Log)			-0.260	-0.206	-0.258	-0.214	-0.271	-0.226
			(0.339)	(0.328)	(0.340)	(0.328)	(0.332)	(0.322)
Agriculture Value Added					0.007	-0.027	0.014	-0.021
					(0.078)	(0.082)	(0.079)	(0.083)
Corruption (0: Bad 6: Good)							0.025	0.022
							(0.016)	(0.016)
Observations	850	850	850	850	850	850	850	850
Countries	57	57	57	57	57	57	57	57
F Stat (first stage): equation (1.13)		33.66		33.74		36.26		36.41
F Stat (first stage): equation (1.14)		66.38		64.36		71.78		70.84

Notes: All specifications include year dummies and the within estimator is used to eliminate country fixed effects. Clustered standard errors at country level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 1.18
The Conditional revenue curse: Domestic tax in % GDP

Dependent variable: Domestic tax in % of GDP	OLS (1)	IV (2)	OLS (3)	IV (4)	OLS (5)	IV (6)	OLS (7)	IV (8)
Resource windfall	-0.076**	-0.283***	-0.085***	-0.293***	-0.086**	-0.294***	-0.084**	-0.288***
	(0.032)	(0.098)	(0.032)	(0.096)	(0.034)	(0.096)	(0.034)	(0.096)
Resource windfall $\times$ $Prog_1$	1.399	3.084*	1.540	3.096**	1.547	3.116**	1.542	3.012**
	(0.988)	(1.578)	(0.942)	(1.541)	(0.944)	(1.531)	(0.961)	(1.506)
$Prog_1$	11.849	11.628	9.173	8.713	9.207	8.814	8.766	8.416
	(14.912)	(14.994)	(14.638)	(14.617)	(14.535)	(14.493)	(14.598)	(14.541)
GDP per capita (Log)			-0.454	-0.493	-0.499	-0.627	-0.467	-0.596
			(1.648)	(1.663)	(1.598)	(1.596)	(1.572)	(1.573)
Trade Openness			0.030**	0.032**	0.030**	0.031**	0.030**	0.031**
			(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
Inflation			-0.002	-0.003	-0.002	-0.003	-0.002	-0.002
			(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Aid (Log)			-0.000	0.006	-0.001	0.004	-0.002	0.003
			(0.029)	(0.028)	(0.027)	(0.026)	(0.026)	(0.025)
Agriculture Value Added					-0.007	-0.021	-0.006	-0.020
					(0.066)	(0.064)	(0.067)	(0.064)
Corruption (0:Bad 6:Good)							0.242	0.208
							(0.225)	(0.226)
Observations	850	850	850	850	850	850	850	850
Countries	57	57	57	57	57	57	57	57
F Stat (first stage): equation (1.13)		33.66		33.34		32.00		32.08
F Stat (first stage): equation (1.14)		66.38		64.35		62.30		61.50

Notes: All specifications include year dummies and the within estimator is used to eliminate country fixed effects. Clustered standard errors at country level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 1.19
The Conditional revenue curse: Middle Income Countries

Dependent variable: Domestic tax per capita (Log)	OLS (1)	IV (2)	OLS (3)	IV (4)	OLS (5)	IV (6)	OLS (7)	IV (8)
Resource windfall	-0.008**	-0.020***	-0.007*	-0.019***	-0.006*	-0.019***	-0.006*	-0.018***
	(0.004)	(0.005)	(0.004)	(0.005)	(0.003)	(0.005)	(0.003)	(0.005)
Resource windfall $\times$ $Prog_1$	0.080	0.130***	0.055	0.131***	0.058	0.137**	0.048	0.114**
	(0.059)	(0.038)	(0.054)	(0.048)	(0.061)	(0.056)	(0.057)	(0.056)
$Prog_1$	1.130	1.027	0.395	0.232	0.420	0.250	0.074	-0.073
	(1.347)	(1.396)	(1.226)	(1.257)	(1.242)	(1.284)	(1.262)	(1.301)
GDP per capita (Log)			0.728***	0.718***	0.754***	0.733***	0.816***	0.792***
			(0.210)	(0.211)	(0.222)	(0.222)	(0.224)	(0.226)
Trade Openness (Log)			0.194	0.210	0.191	0.209	0.183	0.201
			(0.168)	(0.165)	(0.170)	(0.168)	(0.171)	(0.169)
Inflation (Log)			-0.010	-0.008	-0.013	-0.010	-0.017	-0.013
			(0.094)	(0.096)	(0.093)	(0.095)	(0.098)	(0.100)
Aid (Log)			0.172	0.270	0.174	0.271	0.361	0.441
			(0.696)	(0.685)	(0.704)	(0.691)	(0.712)	(0.695)
Agriculture Value Added (Log)					0.054	0.031	0.055	0.033
					(0.132)	(0.131)	(0.129)	(0.128)
Corruption (0: Bad 6: Good)							0.040*	0.037
							(0.023)	(0.024)
Observations	490	490	490	490	490	490	490	490
Countries	32	32	32	32	32	32	32	32
F Stat (first stage): equation (1.13)		41.51		44.31		48.96		48.26
F Stat (first stage): equation (1.14)		348.85		354.74		405.07		380.13

Notes: All specifications include year dummies and the within estimator is used to eliminate country fixed effects. Clustered standard errors at country level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 1.20
The Conditional revenue curse - Low Income Countries

Dependent variable: Domestic tax per capita (Log)	OLS (1)	IV (2)	OLS (3)	IV (4)	OLS (5)	IV (6)	OLS (7)	IV (8)
Resource windfall	-0.014**	-0.051	-0.010***	-0.063**	-0.010***	-0.065**	-0.010***	-0.064**
	(0.006)	(0.034)	(0.003)	(0.030)	(0.003)	(0.031)	(0.003)	(0.031)
Resource windfall $\times$ $Prog_1$	0.386**	0.833	0.259**	0.927*	0.261**	0.942*	0.267**	0.937*
	(0.172)	(0.561)	(0.105)	(0.516)	(0.104)	(0.522)	(0.105)	(0.520)
$Prog_1$	-0.695	-0.670	-0.574	-0.587	-0.571	-0.595	-0.574	-0.596
	(2.313)	(2.349)	(1.605)	(1.634)	(1.600)	(1.637)	(1.609)	(1.642)
GDP per capita (Log)			1.139***	1.109***	1.148***	1.083***	1.137***	1.077***
			(0.289)	(0.271)	(0.286)	(0.267)	(0.298)	(0.277)
Trade Openness (Log)			0.277*	0.315**	0.282*	0.304**	0.281*	0.303**
			(0.159)	(0.141)	(0.164)	(0.149)	(0.162)	(0.148)
Inflation (Log)			-0.300	-0.276	-0.302	-0.270	-0.285	-0.262
			(0.210)	(0.206)	(0.207)	(0.198)	(0.214)	(0.200)
Aid (Log)			-0.134	-0.006	-0.128	-0.020	-0.153	-0.034
			(0.383)	(0.379)	(0.380)	(0.368)	(0.385)	(0.375)
Agriculture Value Added(Log)					0.031	-0.083	0.041	-0.078
					(0.126)	(0.187)	(0.128)	(0.185)
Corruption (0: Bad 6:Good)							0.023	0.013
							(0.027)	(0.025)
Observations	360	360	360	360	360	360	360	360
Countries	25	25	25	25	25	25	25	25
F Stat (first stage): equation (1.13)		6.13		6.45		6.36		6.62
F Stat (first stage): equation (1.14)		10.87		11.36		11.36		11.73

Notes: All specifications include year dummies and the within estimator is used to eliminate country fixed effects. Clustered standard errors at country level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 1.21
The Conditional revenue curse - Dropping countries with no (zero) rent

Dependent variable: Domestic tax per capita (Log)	OLS (1)	IV (2)	OLS (3)	IV (4)	OLS (5)	IV (6)	OLS (7)	IV (8)
Resource windfall	-0.009***	-0.027***	-0.008***	-0.030***	-0.008***	-0.030***	-0.008***	-0.029***
	(0.003)	(0.008)	(0.003)	(0.007)	(0.003)	(0.007)	(0.003)	(0.007)
Resource windfall × $Prog_1$	0.155**	0.259**	0.124**	0.299***	0.130**	0.307***	0.129**	0.289***
	(0.067)	(0.113)	(0.055)	(0.111)	(0.054)	(0.109)	(0.056)	(0.109)
$Prog_1$	-0.023	-0.066	-0.038	-0.094	-0.035	-0.091	-0.111	-0.161
	(1.623)	(1.638)	(1.291)	(1.282)	(1.282)	(1.276)	(1.282)	(1.276)
GDP per capita (Log)			0.925***	0.919***	0.981***	0.951***	0.991***	0.961***
			(0.137)	(0.138)	(0.156)	(0.153)	(0.152)	(0.150)
Trade Openness (Log)			0.252**	0.266**	0.255**	0.268**	0.245**	0.258**
			(0.121)	(0.114)	(0.121)	(0.114)	(0.119)	(0.113)
Inflation (Log)			-0.194	-0.195	-0.197	-0.197	-0.177	-0.180
			(0.140)	(0.137)	(0.138)	(0.135)	(0.141)	(0.138)
Aid (Log)			-0.089	-0.018	-0.057	0.001	-0.073	-0.014
			(0.414)	(0.402)	(0.417)	(0.404)	(0.396)	(0.385)
Agriculture Value Added (Log)					0.106	0.062	0.116	0.071
					(0.085)	(0.094)	(0.086)	(0.093)
Corruption (0:Bad 6:Good)							0.040**	0.036*
							(0.019)	(0.019)
Observations	814	814	814	814	814	814	814	814
Countries	54	54	54	54	54	54	54	54
F Stat (first stage): equation (1.13)		33.07		33.20		35.49		35.69
F Stat (first stage): equation (1.14)		67.35		65.42		72.78		71.85

Notes: All specifications include year dummies and the within estimator is used to eliminate country fixed effects. Clustered standard errors at country level in parentheses. The countries dropped are: Panama, Mali and Paraguay. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 1.22
The Conditional revenue curse - Dropping Oman and Iran

Dependent variable: Domestic tax per capita (Log)	OLS (1)	IV (2)	OLS (3)	IV (4)	OLS (5)	IV (6)	OLS (7)	IV (8)
Resource windfall	-0.007**	-0.026***	-0.007***	-0.031***	-0.007***	-0.031***	-0.006**	-0.030***
	(0.003)	(0.008)	(0.003)	(0.007)	(0.003)	(0.007)	(0.003)	(0.007)
Resource windfall × Prog1	0.125**	0.269**	0.115*	0.315***	0.117**	0.316***	0.116*	0.302***
	(0.063)	(0.112)	(0.060)	(0.112)	(0.058)	(0.111)	(0.059)	(0.110)
$Prog_1$	-0.119	-0.139	-0.279	-0.318	-0.288	-0.319	-0.327	-0.354
	(1.745)	(1.769)	(1.300)	(1.305)	(1.293)	(1.305)	(1.302)	(1.312)
GDP per capita (Log)			0.946***	0.943***	0.973***	0.946***	0.982***	0.954***
			(0.138)	(0.140)	(0.153)	(0.152)	(0.150)	(0.149)
Trade Openness(Log)			0.332***	0.343***	0.334***	0.344***	0.326***	0.336***
			(0.106)	(0.099)	(0.106)	(0.099)	(0.105)	(0.099)
Inflation (Log)			-0.212	-0.212	-0.214	-0.212	-0.198	-0.198
			(0.142)	(0.139)	(0.141)	(0.138)	(0.143)	(0.140)
Aid (Log)			-0.171	-0.089	-0.155	-0.087	-0.170	-0.102
			(0.393)	(0.385)	(0.394)	(0.383)	(0.379)	(0.370)
Agriculture Value Added (Log)					0.054	0.006	0.062	0.015
					(0.083)	(0.090)	(0.083)	(0.089)
Corruption (0:Bad 6:Good)							0.032*	0.028
							(0.018)	(0.018)
Observations	831	831	831	831	831	831	831	831
Countries	55	55	55	55	55	55	55	55
F Stat (first stage): equation (1.13)		36.27		36.36		39.23		39.35
F Stat (first stage): equation (1.14)		64.04		62.07		68.99		68.30

Notes: All specifications include year dummies and the within estimator is used to eliminate country fixed effects. Clustered standard errors at country level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 1.23
The Conditional revenue curse - Dynamic panel specification

Dependent variable: Domestic tax per capita (Log)	OLS (1)	IV (2)	OLS (3)	IV (4)	OLS (5)	IV (6)	OLS (7)	IV (8)
Lagged dependent	0.771***	0.771***	0.686***	0.686***	0.686***	0.686***	0.682***	0.682***
	(0.030)	(0.030)	(0.035)	(0.035)	(0.034)	(0.034)	(0.034)	(0.034)
Resource windfall	-0.008***	-0.015***	-0.008***	-0.017***	-0.008***	-0.017***	-0.008***	-0.016***
	(0.002)	(0.006)	(0.002)	(0.005)	(0.002)	(0.005)	(0.002)	(0.005)
Resource windfall$\times$ Prog_1	0.152***	0.239**	0.141***	0.249***	0.141***	0.249***	0.141***	0.244***
	(0.058)	(0.094)	(0.050)	(0.086)	(0.051)	(0.085)	(0.050)	(0.084)
Prog_1	1.263***	1.270***	1.101**	1.093**	1.100**	1.093**	1.068**	1.063**
	(0.368)	(0.375)	(0.519)	(0.526)	(0.520)	(0.525)	(0.520)	(0.524)
GDP per capita (Log)			0.302***	0.299***	0.308***	0.297***	0.315***	0.304***
			(0.050)	(0.051)	(0.055)	(0.056)	(0.057)	(0.057)
Trade Openness (Log)			0.115**	0.122**	0.115**	0.122**	0.114**	0.120**
			(0.054)	(0.053)	(0.054)	(0.052)	(0.053)	(0.052)
Inflation (Log)			-0.092	-0.091	-0.092	-0.091	-0.087	-0.086
			(0.091)	(0.090)	(0.091)	(0.090)	(0.090)	(0.089)
Aid (Log)			-0.098	-0.077	-0.095	-0.078	-0.102	-0.084
			(0.198)	(0.194)	(0.203)	(0.200)	(0.200)	(0.197)
Agriculture Value Added (Log)					0.010	-0.004	0.014	-.0003
					(0.040)	(0.042)	(0.040)	(0.042)
Corruption (0: Bad 6: Good)							0.013	0.011
							(0.009)	(0.009)
Observations	846	846	846	846	846	846	846	846
Countries	57	57	57	57	57	57	57	57
F Stat (first stage): equation (1.13)		32.48		32.63		34.97		35.02
F Stat (first stage): equation (1.14)		64.70		63.84		70.13		68.63

Notes: All specifications include year dummies and the within estimator is used to eliminate country fixed effects. Clustered standard errors at country level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 1.24
Market power

Natural resource & Top exporters	
Coal	Over the period (2003-2005), three countries have the highest shares of global exports. Australia (31%) Indonesia (15.82%) and China (9.95%) Source: http://www.sourcewatch.org/index.php/Coal_exports
Copper	Chile is the greatest exporter of copper in the world. Over the period (1999-2005), Chile's share of copper exports is 39.63% .
Phosphates	Morocco is the largest exporter of phosphates in the world and accounts for 30% of global exports. Source: http://www.reuters.com/article/2010/09/02/fertiliser-japan-idUKTOE67N04020100902
Tin	Indonesia is the leading exporter of Tin. Source: http://www.bloomberg.com/news/articles/2015-04-22/world-s-biggest-tin-exporter-cuts-output-after-price-rout

Note: The table is focused on natural resources for which the countries in the sample may have a market power.

Table 1.25
The Conditional revenue curse - Other resource rents

Dependent variable: Domestic tax per capita (Log)	OLS (1)	IV (2)	OLS (3)	IV (4)	OLS (5)	IV (6)	OLS (7)	IV (8)
Resource windfall	-0.005	-0.027	-0.010	-0.036*	-0.010	-0.036*	-0.008	-0.033*
	(0.010)	(0.020)	(0.009)	(0.019)	(0.009)	(0.019)	(0.009)	(0.020)
Resource windfall $\times$ $Prog_1$	0.097	0.521	0.127	0.581*	0.147	0.590*	0.116	0.532
	(0.157)	(0.386)	(0.160)	(0.331)	(0.159)	(0.331)	(0.167)	(0.343)
$Prog_1$	0.812	0.840	0.202	0.222	0.207	0.225	-0.011	0.013
	(1.736)	(1.719)	(1.448)	(1.438)	(1.443)	(1.434)	(1.422)	(1.416)
GDP per capita (Log)			0.917***	0.920***	0.954***	0.960***	0.974***	0.979***
			(0.128)	(0.129)	(0.146)	(0.147)	(0.141)	(0.142)
Trade Openness (Log)			0.266**	0.268**	0.268**	0.270**	0.258**	0.261**
			(0.125)	(0.125)	(0.124)	(0.124)	(0.122)	(0.122)
Inflation (Log)			-0.067	-0.062	-0.071	-0.067	-0.047	-0.044
			(0.069)	(0.070)	(0.069)	(0.070)	(0.078)	(0.079)
Aid (Log)			-0.454	-0.444	-0.429	-0.416	-0.467	-0.453
			(0.474)	(0.477)	(0.481)	(0.485)	(0.446)	(0.449)
Agriculture Value Added (Log)					0.074	0.078	0.087	0.090
					(0.089)	(0.089)	(0.089)	(0.089)
Corruption (0: Bad 6:Good)							0.047**	0.046**
							(0.019)	(0.019)
Observations	777	777	777	777	777	777	777	777
Countries	50	50	50	50	50	50	50	50
F Stat (first stage): equation (1.13)		35.80		34.94		34.44		34.84
F Stat (first stage): equation (1.14)		43.71		45.87		44.50		45.18

Notes: All specifications include year dummies and the within estimator is used to eliminate country fixed effects. Clustered standard errors at country level in parentheses. Resource windfall refers in this case to other natural resource windfall excluding oil. The instrument used is the country-specific price index growth of the other natural resources. Again, following the literature on the "resource curse" (Ross, 2001 ; Sala-i-Martin and Subramanian, 2003 ; Tsui, 2011) I distinguish oil rents from the other natural resource rents (See also Table 1.26) . Unfortunately in the robustness check I lose 7 countries that do not have data on oil rents. The countries are: Gambia, Guyana, Niger, Madagascar, Mali, Malawi and Uganda. The same number of countries is used in the two tables. In another robustness check, I separate oil rent from other resource rents to test for a potential heterogeneous effect of natural resources. Column (4) shows that at a level of structural progressivity of 0.05, 1 percentage point increase in other rent windfall generates a reduction in domestic tax revenues per capita by 0.7%. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 1.26
The Conditional revenue curse - Oil rent

Dependent variable: Domestic tax per capita (Log)	OLS (1)	IV (2)	OLS (3)	IV (4)	OLS (5)	IV (6)	OLS (7)	IV (8)
Oil windfall	-0.006*	-0.030***	-0.006**	-0.026***	-0.005*	-0.026***	-0.005*	-0.025***
	(0.003)	(0.010)	(0.003)	(0.006)	(0.003)	(0.006)	(0.003)	(0.006)
Oil windfall $\times$ $Prog_1$	0.118	0.127	0.119*	0.212**	0.118*	0.222**	0.112*	0.210**
	(0.095)	(0.097)	(0.068)	(0.099)	(0.069)	(0.104)	(0.068)	(0.106)
$Prog_1$	0.848	0.803	0.236	0.203	0.239	0.210	0.020	0.003
	(1.759)	(1.785)	(1.459)	(1.455)	(1.457)	(1.453)	(1.435)	(1.437)
GDP per capita (Log)			0.912***	0.904***	0.948***	0.925***	0.970***	0.945***
			(0.128)	(0.130)	(0.146)	(0.148)	(0.142)	(0.143)
Trade Openness (Log)			0.269**	0.283**	0.271**	0.284**	0.261**	0.274**
			(0.124)	(0.118)	(0.123)	(0.118)	(0.121)	(0.115)
Inflation (Log)			-0.066	-0.068	-0.070	-0.070	-0.047	-0.048
			(0.068)	(0.067)	(0.068)	(0.066)	(0.078)	(0.075)
Aid (Log)			-0.461	-0.386	-0.438	-0.375	-0.475	-0.411
			(0.475)	(0.457)	(0.481)	(0.462)	(0.445)	(0.430)
Agriculture Value Added (Log)					0.070	0.040	0.084	0.054
					(0.089)	(0.098)	(0.090)	(0.097)
Corruption (0: Bad 6:Good)							0.048**	0.045**
							(0.019)	(0.018)
Observations	777	777	777	777	777	777	777	777
Countries	50	50	50	50	50	50	50	50
F Stat (first stage): equation (1.13)		10.68		10.83		11.14		11.13
F Stat (first stage): equation (1.14)		32.32		33.14		30.99		30.58

Notes: All specifications include year dummies and the within estimator is used to eliminate country fixed effects. Clustered standard errors at country level in parentheses. Resource windfall refers in this case to oil rent windfall. The instrument used is the country specific oil price index growth . Column (8) shows that at the maximum level of structural progressivity in the sample, 1 percentage point increase in oil rent windfall causes a reduction in domestic tax revenues per capita by 1.45%. The conditional effect in this case is higher than the one in the baseline result using all 14 natural resources (reduction by 1.21%) and it is consistent with the particularly detrimental effect of oil. Overall Table 1.11 and Table 1.2 2 suggest that progressive taxation may dampen the revenue curse. This result is depicted in Figure B_2 (Appendix B) showing a flatter curve of the marginal effect in the case of oil rent than in the baseline result (Figure 1.5). Table 1.25 and Table 1.26 together show that the type of natural resource rent does not seem to matter except for the fact that the outcome of progressive taxation may be less in the case of oil rents than in the case of other resource rents.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 1.27
The Conditional revenue curse - Excluding OPEC members

Dependent variable: Domestic tax per capita (Log)	OLS (1)	IV (2)	OLS (3)	IV (4)	OLS (5)	IV (6)	OLS (7)	IV (8)
Resource windfall	-0.009**	-0.025***	-0.008**	-0.027***	-0.008**	-0.027***	-0.008*	-0.026***
	(0.004)	(0.009)	(0.004)	(0.006)	(0.004)	(0.007)	(0.004)	(0.006)
Resource windfall × $Prog_1$	0.130**	0.249**	0.131*	0.298**	0.144**	0.315***	0.139**	0.301***
	(0.066)	(0.118)	(0.067)	(0.118)	(0.064)	(0.114)	(0.065)	(0.111)
$Prog_1$	-0.539	-0.586	-0.538	-0.584	-0.589	-0.625	-0.622	-0.653
	(1.838)	(1.852)	(1.184)	(1.195)	(1.161)	(1.176)	(1.174)	(1.185)
GDP per capita (Log)			0.941***	0.937***	1.008***	0.993***	1.021***	1.005***
			(0.138)	(0.138)	(0.158)	(0.157)	(0.155)	(0.154)
Trade Openness (Log)			0.418***	0.416***	0.421***	0.419***	0.412***	0.411***
			(0.090)	(0.090)	(0.090)	(0.090)	(0.090)	(0.090)
Inflation (Log)			-0.192	-0.198	-0.196	-0.200	-0.182	-0.188
			(0.146)	(0.144)	(0.145)	(0.143)	(0.146)	(0.144)
Aid (Log)			-0.168	-0.105	-0.128	-0.072	-0.140	-0.085
			(0.395)	(0.390)	(0.398)	(0.393)	(0.388)	(0.385)
Agriculture Value Added (Log)					0.128	0.108	0.134	0.114
					(0.082)	(0.078)	(0.083)	(0.079)
Corruption (0: Bad 6:Good)							0.024	0.021
							(0.017)	(0.018)
Observations	765	765	765	765	765	765	765	765
Countries	52	52	52	52	52	52	52	52
F Stat (first stage): equation (1.13)		23.043		21.994		22.659		22.509
F Stat (first stage): equation (1.14)		39.374		37.213		39.869		39.306

Notes: All specifications include year dummies and the within estimator is used to eliminate country fixed effects. Clustered standard errors at country level in parentheses. These estimates exclude OPEC members in the sample: Algeria, Ecuador, Indonesia, Iran and Nigeria.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 1.28
The revenue curse - Robustness using a different price index

Dependent variable: Domestic tax per capita (Log)	(1) OLS	(2) IV	(3) OLS	(4) IV	(5) OLS	(6) IV	(7) OLS	(8) IV
Resource windfall	-0.009***	-0.032**	-0.008***	-0.027***	-0.008***	-0.028***	-0.008***	-0.027***
	(0.003)	(0.013)	(0.002)	(0.009)	(0.002)	(0.009)	(0.002)	(0.008)
GDP per capita (Log)			1.072***	1.061***	1.061***	1.027***	1.053***	1.022***
			(0.139)	(0.135)	(0.145)	(0.140)	(0.140)	(0.136)
Trade openness (Log)			0.230**	0.232**	0.229**	0.230**	0.216**	0.217**
			(0.100)	(0.098)	(0.100)	(0.098)	(0.098)	(0.096)
Inflation (Log)			-0.173***	-0.180***	-0.173***	-0.179***	-0.167***	-0.173***
			(0.037)	(0.035)	(0.037)	(0.034)	(0.036)	(0.033)
Aid (Log)			-0.334	-0.262	-0.337	-0.271	-0.356	-0.291
			(0.470)	(0.460)	(0.470)	(0.458)	(0.452)	(0.443)
Agriculture Value Added (Log)					-0.021	-0.066	-0.009	-0.053
					(0.091)	(0.101)	(0.091)	(0.100)
Corruption (0: Bad 6: Good)							0.052**	0.047**
							(0.020)	(0.020)
Observations	1054	1054	1054	1054	1054	1054	1054	1054
Countries	57	57	57	57	57	57	57	57
F Stat (first stage)		62.69		63.48		63.99		63.24

Notes: All specifications include year dummies and the within estimator is used to eliminate country fixed effects. Clustered standard errors at country level in parentheses. In this table, I use a price index with 2000 as the base year. In addition, the time-invariant export share of a given resource is the ratio of this resource's export over the total export of the country in 2000. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 1.29
Average level of structural progressivity

Country	$Prog_1$	$Prog_2$
Argentina	0.012	0.015
Bahrain	0	0
Bangladesh	0.002	0
Bolivia	0.025	0.031
Botswana	0.02	0.024
Cameroon	0.044	0.050
Congo Rep.of	0.039	0.037
Chile	0.008	0.009
China	0.007	0.009
Costa Rica	0.013	0.012
Dominican Rep	0.006	0.005
Algeria	0.061	0.061
Ecuador	0.006	0.007
Egypt	0.010	0.011
El Salvador	0.009	0.009
Ethiopia	0.022	0.031
Gabon	0.054	0.054
Ghana	0.037	0.034
Gambia	0.024	0.028
Guatemala	0.003	0.004
Guyana	0.063	0.089
Haiti	0.003	0.003
Honduras	0.0005	0
India	0.003	0.0004
Indonesia	0.0234	0.025
Iran	0.0264	0.0267
Ivory Coast	0.018	0.022
Jamaica	0.063	0.073
Kenya	0.081	0.067
Morocco	0.038	0.045
Madagascar	0.002	0.002

Source: Andrew Young School World Tax Indicators (Volume 1). Average over 1981-2005 (Authors' calculation)

Average level of structural progressivity (ctd)

Country	$Prog_1$	$Prog_2$
Malawi	0.016	0.019
Malaysia	0.024	0.029
Mali	0.027	0.026
Mozambique	0.015	0.021
Niger	0.002	0.002
Nigeria	0.024	0.021
Oman	0	0
Pakistan	0.004	0.002
Papua New Guinea	0.018	0.022
Panama	0.021	0.024
Paraguay	0	0
Peru	0.008	0.009
Philippines	0.029	0.032
Senegal	0.047	0.053
South Africa	0.056	0.066
Sri Lanka	0.016	0.018
Syria	0.014	0.010
Tanzania	0.022	0.022
Thailand	0.013	0.014
Togo	0.033	0.044
Trinidad and Tobago	0.086	0.080
Tunisia	0.035	0.038
Uganda	0.016	0.015
Uruguay	0	0
Zambia	0.049	0.058
Zimbabwe	0.038	0.047

Source: Andrew Young School World Tax Indicators (Volume 1). Average over 1981-2005 (Authors' calculation)

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Chapter 2
FISCAL RULES, POLITICAL BUDGET CYCLES AND RESOURCE WEALTH

"the most powerful argument for fiscal rules centers on their political economy aspects." (Kopits and Symansky, 1998)

Introduction

Les politiciens, pour augmenter leurs chances de réélection, peuvent entreprendre des manipulations budgétaires au cours des années électorales (Rogoff, 1990). Ces manipulations peuvent prendre la forme d'une augmentation des dépenses publiques et entraîner souvent une indiscipline budgétaire et une volatilité macroéconomique. Par conséquent, une question importante est de savoir comment freiner les dépenses publiques à motivation politique? De nombreux pays en développement ont adopté des règles budgétaires définies par Kopits et Symanski (1998) comme une «contrainte permanente sur la politique budgétaire en termes d'un indicateur récapitulatif de la performance budgétaire». Étant donné que les règles budgétaires sont des contraintes institutionnelles sur la politique budgétaire et que leur adoption est destinée à améliorer la discipline budgétaire, ce chapitre examine si les règles budgétaires adoptées dans les pays en développement ont été efficaces pour limiter les cycles politico-budgétaires. En effet, les résultats dans les pays développés peuvent ne pas être une bonne référence pour les pays en développement en raison de la faiblesse institutionnelle dans ces derniers.

L'identification de l'effet causal des règles budgétaires est difficile pour deux raisons principales : un problème de causalité inverse (l'orientation budgétaire peut déterminer l'adoption des règles budgétaires) et un biais de variable omise (la préférence des électeurs pour la discipline budgétaire peut déterminer à la fois l'adoption des règles budgétaires et les performances budgétaires). Tout d'abord, l'adoption de règles budgétaires peut simplement refléter les préférences des électeurs pour la discipline fiscale (Poterba, 1996). Étant donné que ces préférences peuvent également avoir une influence sur les performances budgétaires, il est important de les prendre en compte afin d'être sûr d'identifier un effet causal des règles budgétaires. Krogstrup et W älti (2008) dans le cas des juridictions infra-fédérales suisses poursuivent cette approche et prennent en compte les préférences budgétaires. Cependant, dans un échantillon de pays, il est difficile de tenir compte des préférences budgétaires variant dans le temps en raison du manque de données. La deuxième source potentielle de biais dans l'estimation de l'effet des règles budgétaires sur les résultats budgétaires est la question de la causalité inverse (Ayuso-i-Casals, Debrun, Kumar, Moulin et Turrini, 2007; Kumar, Baldacci, Schaechter, Caceres,Kim, Debrun, Escolano,Jonas, Karam, Yakadina, et Zymek, 2009). En effet, les résultats budgétaires peuvent eux-mêmes conduire à l'adoption de règles budgétaires. À cet égard, Schaechter, Kinda, Budina et Weber (2012) constatent que la détérioration de la situation budgétaire qui a suivi la crise financière de 2008-2009 a conduit de nombreux pays à adopter des règles budgétaires.

Méthodologie et résultats

Dans ce chapitre, nous abordons les deux problèmes (préférences non observables et causalité inverse) en exploitant d'abord la répartition géographique des pays qui ont des règles budgétaires en place pour instrumenter les règles budgétaires nationales. Ce chapitre fait suite au premier en analysant un deuxième aspect des finances publiques, notamment les dépenses publiques. L'idée est la suivante : la probabilité qu'un pays puisse avoir de telles règles pourrait augmenter à mesure que

les pays voisins le font. La proximité géographique est un puissant canal de diffusion des réformes politiques (Brueckner, 2003; Pitlik, 2007). Nous utilisons le nombre de pays voisins qui ont des règles budgétaires dans une sous-région donnée pour prédire la probabilité d'adopter des règles budgétaires nationales. Ensuite, nous utilisons la probabilité prédite comme instrument. Nous soutenons que la dimension géographique dans l'adoption des règles budgétaires offre une source unique d'inférence causale. La popularité sous-régionale des règles budgétaires devrait affecter les décisions de politique budgétaire au niveau des pays uniquement à travers le choix de ce pays d'avoir des règles budgétaires. Nous fournissons plusieurs arguments en faveur de la validité de la restriction d'exclusion. En outre, nous augmentons cette approche en utilisant un deuxième instrument et en testant la suridentification. Dans cette approche augmentée, nous combinons notre stratégie de référence (compte tenu de l'endogénéité de l'adoption) avec la persistance du processus législatif. Nous utilisons donc un indice de la force des règles et utilisons sa valeur retardée comme instrument supplémentaire. La première contribution du chapitre est alors de proposer une stratégie empirique qui nous permet de prendre en compte le problème de l'endogénéité et donc d'étudier un lien de causalité entre les règles budgétaires et les cycles politico-budgétaires.[1] En outre, l'inclusion des effets fixes par pays et des tendances linéaires propres à chaque pays dans toutes les spécifications nous permet de prendre en compte les préférences non observées.

De plus, les études antérieures suggèrent également que les caractéristiques des règles budgétaires sont importantes pour leur efficacité. Par exemple, le type de règles et leurs caractéristiques institutionnelles peuvent être particulièrement pertinents pour les cycles politico-budgétaires. Ces derniers sont des phénomènes à court

[1]Tapsoba (2012) utilise une approche de "matching" (différente de notre stratégie de variable instrumentale) pour faire face au problème de l'auto-sélection dans l'étude des effets des règles budgétaires sur le budget. Le problème de l'auto-sélection peut être considéré comme un problème de variable omise qu'une stratégie de variable intrumentale devrait traiter. Cette approche d'appariement ou de "matching" consiste à associer des pays qui ont des règles budgétaires avec des pays qui ne les ont pas sur la base des variables observables similaires et ne peut malheureusement pas tenir compte de la sélection en fonction des éléments non observables.

terme. Les règles d'équilibre budgétaire et les règles de dépense qui limitent particulièrement la politique budgétaire à court terme (par opposition aux règles de dette qui sont contraignantes à long terme) devraient donc être plus efficaces pour contraindre la politique budgétaire discrétionnaire pendant les années électorales. En ce qui concerne les caractéristiques institutionnelles, les règles qui sont surveillées par des organismes indépendants du gouvernement parce qu'elles sont particulièrement strictes (Debrun *et al.*, 2008; Schaechter *et al.*, 2012; Nerlich et Reuter, 2013; Debrun et Kinda, 2014) devraient être plus efficaces pour contraindre les cycles politico-budgétaires. En particulier, le non respect des règles qui sont surveillées par des organismes indépendants du gouvernement peut imposer des coûts politiques élevés (Debrun *et al.*, 2008).

D'autre part, l'effet théorique des règles qui couvrent les administrations publiques générales (par opposition aux règles couvrant l'administration centrale) n'est pas clair a priori. En effet, les règles budgétaires avec cette caractéristique peuvent perdre en efficacité en ciblant les agrégats budgétaires qui sont contrôlés par différents niveaux de gouvernement, mais sont également considérés comme plus strictes (Debrun *et al.*, 2008; Schaechter *et al.*, 2012 et Nerlich et Reuter, 2013). Ensuite, nous étudions l'impact à long terme des règles budgétaires en testant si les effets des règles budgétaires varient selon le rang des élections depuis l'adoption de ces règles. Il est possible que ces règles soient plus crédibles dans la durée. La deuxième contribution du chapitre consiste donc non seulement à se concentrer sur le type de règles en place, mais aussi sur leurs caractéristiques institutionnelles et à montrer que leur efficacité varie à long terme. Enfin, nous analysons la dimension «malédiction des ressources naturelles» des cycles politico-budgétaires et le rôle potentiel des règles budgétaires. En effet, la richesse en ressources peut exacerber le cycle politico-budgétaire (Robinson *et al.*, 2006; Vergne, 2009; Klomp et De Haan, 2016).

Notre analyse empirique dans un échantillon de 67 pays en développement sur la période 1985-2007 montre que ces règles entraînent une discipline budgétaire durant le cycle électoral. Plus précisément, dans les années électorales avec des règles

budgétaires en place, la consommation publique est réduite de 1,65 % du PIB (relativement aux années sans règles). En outre, l'efficacité de ces règles dépend de leur type, de leur caractéristique institutionnelle et de leur persistance. En particulier, les règles de dépense, les règles couvrant les administrations publiques générales et les règles caractérisées par un organe de contrôle en dehors du gouvernement, atténuent les cycles politico-budgétaires en matière de dépense publique. Ces résultats sont novateurs en montrant que le niveau de gouvernement visé par les règles et le suivi du respect de la règle sont importants pour le cycle politico-budgétaire. En outre, en suivant la littérature, nous explorons l'effet dans les démocraties et constatons que cet effet de discipline est particulièrement prononcé lors d'élections compétitives. Les résultats ont des implications politiques importantes que nous discuterons plus en détail. Aussi, le lien de causalité que nous établissons dans ce chapitre renforce la crédibilité de ces implications politiques. Enfin, nous constatons que les cycles politico-budgétaires sont particulièrement importants dans les pays riches en ressources naturelles. Cependant, nous ne trouvons pas de preuves solides sur le rôle des règles budgétaires à cet égard.

Littérature associée

Ce chapitre est étroitement lié à une littérature relativement limitée sur l'effet des règles budgétaires sur les cycles politico-budgétaires, principalement axée sur les pays développés. Sur le plan théorique, dans son prolongement du cadre de Rogoff et Sibert (1998), Rose (2006) montre qu'une règle (d'équilibre budgétaire) contraignante, en empêchant un politicien de présenter un budget en déficit et en rendant ainsi tous les éléments de la politique budgétaire (les dépenses publiques et les taxes) contemporainement visibles à l'électeur, élimine le cycle politico-budgétaire. Les électeurs peuvent inférer la compétence du politicien qui ne tire plus un avantage électoral de la manipulation de la politique budgétaire comme outil de signalisation. Rose (2006) trouve également que, dans les États américains, des règles strictes d'équilibre budgétaire limitent la capacité des politiciens à manipuler la politique

budgétaire à des fins électorales. Sur le plan empirique, Ebeke et Ölçer (2013) sont une exception parce qu'ils étudient l'effet des règles budgétaires sur le cycle politico-budgétaire dans les pays à faible revenu. Cependant, comme ils le reconnaissent, leur analyse se concentre sur un échantillon de pays à faible revenu avec seulement 4 pays qui ont des règles budgétaires en place suscitant des inquiétudes quant à la fiabilité de l'inférence statistique. Notre échantillon comprend tous les pays en développement (y compris les pays à faible revenu) et nous avons un plus grand échantillon de pays avec des règles budgétaires. En outre, Ebeke et Ölçer (2013) ne traitent pas de l'endogénéité des règles budgétaires comme nous le faisons dans ce chapitre.

Ce chapitre est également lié à une littérature mettant l'accent sur le rôle des institutions dans la limitation de la discrétion de la politique budgétaire. Par exemple, Shi et Svensson (2006) montrent que l'environnement institutionnel peut changer les incitations des politiciens. De plus, Fatás et Mihov (2006) trouvent que les règles budgétaires réduisent l'utilisation discrétionnaire de la politique budgétaire (aux États-Unis). Dans cette optique, Schuknecht (2000) soutient que les mécanismes institutionnels conçus pour limiter les dépenses publiques discrétionnaires peuvent aider à prévenir les politiques opportunistes en période électorale dans les pays en développement.

Le reste du chapitre est organisé comme suit. La section 2.2 présente la méthodologie empirique et les données utilisées pour tester l'effet des règles budgétaires sur les cycles politico-budgétaires dans les pays en développement. La section 2.3 rapporte les résultats et la section 2.4 analyse la dimension «ressource naturelle» des cycles politico-budgétaires et le rôle potentiel des règles budgétaires. Section 2.5 utilise une approche empirique augmentée qui nous permet de tester la suridentification. Enfin, la section 2.6 conclut.

2.1 Introduction

Politicians, in order to increase their chances of reelection, may undertake fiscal manipulations in election years (Rogoff, 1990). These fiscal manipulations can take the form of increased public expenditures and often lead to fiscal indiscipline and macroeconomic volatility. Therefore an important question is how to curb politically motivated public spending? Many developing countries have adopted fiscal rules defined by Kopits and Symanski (1998) as "permanent constraint on fiscal policy in terms of a summary indicator of fiscal performance". Because fiscal rules are institutional constraints on fiscal policy and their adoption is intended to enhance fiscal discipline, this paper tests whether fiscal rules adopted in developing countries have been effective in constraining political budget cycles. Indeed, the findings in developed countries may not be a good benchmark for developing countries because of the potential weakness of the enforcement capacity in the latter.

The identification of the causal effect of fiscal rules is challenging for two main reasons: a reverse causality problem (fiscal stance can determine the adoption of fiscal rules) and an omitted variable bias (voters' preference for fiscal discipline can determine both the adoption of fiscal rules and budgetary outcomes). First, the adoption of fiscal rules may simply reflect voters' preferences for fiscal discipline (Poterba, 1996). Since these preferences may also have an influence on fiscal outcomes, it is important to control for them in order to be sure to identify a causal effect of fiscal rules. Krogstrup and Wälti (2008) in the case of Swiss sub-federal jurisdictions pursue this approach and control for fiscal preferences. However in a cross-country sample, it is difficult to account for time varying fiscal preferences because of data availability issue. The second potential source of bias in estimating the effect of fiscal rules on budgetary outcomes is the reverse causality issue (Ayuso-i-Casals *et al.*, 2007; Kumar *et al.*, 2009). Indeed, budgetary outcomes may themselves lead to the adoption of fiscal rules.

In this regard, Schaechter *et al.* (2012) find that the fiscal distress that followed the financial crisis of 2008-2009 has led many countries to the adoption of fiscal rules.

In this paper, we address both issues (unobservable preferences and reverse causality) by first exploiting the geographical distribution of countries that have fiscal rules in place to instrument for national fiscal rules. The idea is the following. The likelihood that a country may have such rules in place may increase as the neighboring countries do so. Geographical proximity is a powerful channel of the diffusion of policy reforms (Brueckner, 2003; Pitlik, 2007). We use the number of neighboring countries that have fiscal rules in a given sub-region to predict the probability of adopting national fiscal rules. Next, we use the predicted probability as an instrument. We argue that the geographical pattern in the adoption of fiscal rules offers a unique source of causal inference. The sub-regional popularity of fiscal rules should affect fiscal policy decisions at a country level only through this country's choice of having fiscal rules. We provide several arguments supporting the validity of the exclusion restriction. In addition, we augment this approach by using a second instrument and testing for over-identifying restrictions. In this augmented approach, we combine our baseline strategy (accounting for the endogeneity of the adoption) with the persistence in the legislative process. We therefore take advantage of an index of the strength of rules and use its lagged value as an additional instrument. The first contribution of the paper is then to propose an empirical strategy that allows us to take into account the endogeneity issue and therefore to investigate a causal link between fiscal rules and budget cycles.[2]

[2]Tapsoba (2012) employs a matching approach (that is different from our instrumental variable strategies) to deal with the self selection problem in investigating the effects of fiscal rules on fiscal outcomes. The self selection problem can be viewed as an omitted variable bias problem that an instrumental variable strategy should address. This matching approach consists in pairing countries that have fiscal rules with countries that do not have them based on similar observable variables, and cannot unfortunately address the selection based on unobservables.

Furthermore, the inclusion of country fixed effects and country-specific linear trends in all specifications allows us to account for unobserved preferences.

Moreover, previous studies also suggest that the design of fiscal rules matter for their effectiveness. For instance, the type of rules and their institutional features may be particularly relevant for political budget cycles. Political budget cycles are short term phenomenons. Balanced budget rules and expenditure rules that especially constrain fiscal policy in the short run (as opposed to debt rules that are binding in the long term) should therefore be more effective in constraining discretionary fiscal policy during election years. Regarding the institutional features, rules that are monitored by independent bodies outside the government because they are particularly stringent (Debrun *et al.*, 2008; Schaechter *et al.*, 2012; Nerlich and Reuter, 2013 and Debrun and Kinda, 2014) should be more successful in constraining political budget cycles. In particular, breaking rules monitored by independent bodies outside the government may impose high political costs (Debrun *et al.*, 2008).

On the other hand, the theoretical effect of rules that cover the general government (as opposed to rules covering the central government) is not clear a priori. Indeed, fiscal rules with this feature may loose in effectiveness by targeting fiscal aggregates that are controlled by different levels of government but are also considered as more stringent (Debrun *et al.*, 2008; Schaechter *et al.*, 2012 and Nerlich and Reuter, 2013). Next, we investigate the long term impact of fiscal rules by testing whether the effects of fiscal rules vary with the rank of the election since the adoption of these rules. It is possible that these rules are more credible the longer they are in place. The second contribution of the paper is thus to focus not only on the type of rules in place but also on their institutional features and how their effectiveness varies in the long run. Finally, we analyze the "resource curse" dimension of political budget cycles and the potential role for fiscal rules. Indeed, resource wealth may exacerbate the political budget cycle (Robinson *et al.*, 2006; Vergne, 2009; Klomp and De Haan, 2016).

Our empirical evidence in a sample of 67 developing countries over the period 1985-2007, shows that these rules cause fiscal discipline over the electoral cycle. More specifically, in election years with fiscal rules in place, public consumption is reduced by 1.65% point of GDP. Furthermore, the effectiveness of these rules depends on their type, their institutional design and whether they have been in place for a long time. In particular, expenditure rules, rules covering the general government and rules characterized by a monitoring body outside the government dampen political budget cycles in government consumption. These results are novel in showing that the level of government targeted by the rules and monitoring the compliance with the rule do matter for the political budget cycle. Also, following the literature, we explore the effect in democracies and find that this discipline effect is particularly strong during competitive elections. The results have important policy implications that we will discuss in more details. In addition, the causal relationship that we establish in this paper strengthens the credibility of these policy implications. Finally, we find that political budget cycles are particularly strong in resource-rich countries. However, we do not find strong evidence on the role for fiscal rules in this regard.

This paper is closely related to a relatively limited literature on the effect of fiscal rules on political budget cycles mostly focused on developed countries. On the theoretical side, in her extension of Rogoff and Sibert (1998)'s framework, Rose (2006) shows that a binding (balanced budget) rule, by preventing an incumbent from running a deficit and thus rendering all elements of fiscal policy (public spending and tax) contemporaneously visible to the voter, eliminates the political budget cycle. Voters can infer the competence of the incumbent who no longer derives an electoral advantage from fiscal policy manipulation as a signaling tool. Rose (2006) also find that in American states, stringent balanced budget rules limit the ability of the incumbents to manipulate fiscal policy for electoral purpose. On the empirical side, Ebeke and Ölçer (2013) is an exception because they investigate the effect of fiscal rules on the political budget cycle in low income countries. However, as they acknowledge, their analysis is focused on a sample of low income countries with only 4 countries that have fiscal rules in place raising concerns about the reliabilty

of the statistical inference. Our sample includes all developing countries (including low income countries) and we have a larger sample of countries with fiscal rules. In addition, Ebeke and Ölçer (2013) do not address the endogeneity of fiscal rules as we do in this paper.

This paper is also related to a literature emphasizing the role of institutions in constraining the discretion of fiscal policy. For instance, Shi and Svensson (2006) show that the institutional environment may change politicians' incentives. Also, Fatás and Mihov (2006) find that fiscal rules reduce the discretionary use of fiscal policy (in the United States). In this vein, Schuknecht (2000) argues that institutional mechanisms designed to constrain discretionary public spending may help prevent opportunistic policies around elections in developing countries.

The remainder of the paper is organized as follows. Section 2.2 presents the empirical methodology and the data employed to test the effect of fiscal rules on political budget cycles in developing countries, Section 2.3 reports the results and Section 2.4 analyzes the "resource curse" dimension of political budget cycles and the potential role for fiscal rules. Section 2.5 uses an augmented empirical approach allowing us to test for over-identifying restrictions. Finally, section 2.6 concludes.

2.2 Data and Empirical Methodology

In this section I discuss the empirical strategy followed by the data description.

2.2.1 Empirical strategy

The empirical strategy relies on an original two-steps instrumental variable approach to investigate the causal effect of fiscal rules. Our main dependent variable is the general government's final consumption expenditure as share of GDP. Not only public expenditures are the most available fiscal variables especially for a long period of analysis in developing countries but also represent a good proxy for discretionary

fiscal policy (Fatás and Mihov, 2003). In addition, in developing countries, the main instrument of expansionary fiscal policies around elections is increasing public expenditures (Schuknecht, 2000 ; Block, 2002).

The endogeneity of fiscal rules is a serious issue. First, as voters' preference for fiscal discipline may determine both the adoption of fiscal rules and budgetary outcomes (Poterba, 1996) an omitted variable bias could be an important source of bias. In addition, there is also a potential reverse causality problem: fiscal stance or budgetary outcomes in general may conduce governments to adopt fiscal rules (Ayuso-i-Casals *et al.*, 2007 and Kumar *et al.*, 2009). We address these threats to the identification of the causal effect of fiscal rules in this paper.

Consider the following specification to test the effect of fiscal rules on political budget cycles :

$$Y_{it} = \beta_1 \text{elec}_{it} + \beta_2 \text{elec}_{it} \times FR_{it} + \beta_3 FR_{it} + \beta_4 X_{it} + \alpha_i + \text{trend}_i + \varepsilon_{it} \tag{2.1}$$

Where Y_{it} is the general government consumption, i and t denote country and year respectively. *elec* is the election index developed by Franzese (2000) that captures the exact moment that an election is held and FR is the fiscal rule dummy variable indicating if in a specific year there is a fiscal rule in place. X is a set of control variables and α_i is a country-specific fixed effect that controls for any country-specific constant characteristic. trend_i is a country-specific trend and ε_{it} is an error term.

Including country-specific linear trends allows us to take into account all time-varying unobserved heterogeneity. The inclusion of the country-specific trend may then pick up voters' preferences for fiscal discipline which may vary over time and are potentially unobserved within country.[3] However accounting for voters' preference for fiscal discipline is probably insufficient. It is possible, as mentioned earlier,

[3]There is evidence that voters' preferences for fiscal discipline may evolve or change over time. See for instance Brender (2003) and Krogstrup and Wälti (2008).

that fiscal outcomes such as public spending (capturing the discretion of fiscal policy) may influence the likelihood of having a fiscal rule, that is a potential reverse causality problem, another source of bias (Ayuso-i-Casals *et al.*, 2007 and Kumar *et al.*, 2009) that will be addressed by our instrumental variable strategy. We exploit therefore the geographical pattern of the adoption of fiscal rules to instrument for the national fiscal rules at country level. We consider countries from three regions (Latin America, Subsaharan Africa and South Asia). The idea is based on an argument of regional diffusion of these rules. Specifically, the likelihood of a country adopting a fiscal rule may increase as the number of neighboring countries that have these rules in place becomes larger. Indeed geographical proximity is a powerful channel of the diffusion of policy reforms (Brueckner, 2003; Pitlik, 2007). Thus, for a given country, we use the number of neighboring countries in the region that have fiscal rules in place in a given year as an instrument.

β_1 and β_2 are the coefficients of interest and capture respectively the effect of the political budget cycle and the effect of fiscal rules on the political budget cycle in public consumption. The hypothesis tested implies that $\beta_1 > 0$ and $\beta_2 < 0$ meaning that the presence of fiscal rules may dampen the pressure on public consumption in election years, following Rose (2006). We follow the approach developed by Wooldridge (2010) that allows to consistently estimate the effects of an endogenous dummy variable (that is fiscal rules in this case). First we estimate a Probit model where we regress FR on the instrument and other covariates in order to predict a probability of having a fiscal rule in place as follows:

$$Pr(FR = 1|X_{it}, \text{Neighbors}_{it}) = \Phi(\delta_0 + \delta_1 \text{Neighbors}_{it} + \delta_2 X_{it}) \tag{2.2}$$

Where $\Phi(.)$ is the cumulative distribution function for a standardized normal random variable, Neighbors_{it} (the instrument) is the number of neighboring countries in the region with a fiscal rule and X a set of other covariates in the model.

The mechanism that we suggest implies that $\delta_1 > 0$ meaning that the likelihood of having a fiscal rule in place in a given country increases with the number of neighboring countries with rules.

Having argued why the instrument should be correlated with fiscal rules' adoption, we turn now to the validity of the exclusion restriction. The identifying assumption is that the number of other countries in a sub-region with fiscal rules in place (capturing the popularity of these rules) should have no effect on public consumption except through their effect on fiscal rules in a given country. This is reasonable since public spending in a country should not be affected by how popular a policy reform is in its sub-region. One potential threat for the identification is that the number of other countries in the sub-region may capture regional macroeconomic shocks that may affect fiscal policy. If these shocks are related to factors such as climate or geography (that are more likely) we may not worry about the violation of the exclusion restriction as they are exogenous. But if these factors are not exogenous, then our instrument may not meet the condition of exogeneity. In this regard,, we control for economic growth, trade openness and public debt in our regressions. These variables capture the effects of potential subregional economic shocks. Moreover our specifications include country-specific linear trends that allow us to deal with time-varying omitted variables which may simultaneously affect the likelihood of fiscal rules' adoption and public consumption at country level. Therefore we find it unlikely that the exclusion restriction is violated.

Finally, we apply a standard IV estimator using the predicted probability ($\hat{FR}$) as an instrument for fiscal rules. As we have two endogenous variables (FR and the interaction term) in equation (2.1) we have two first stages. The first stage for fiscal rules is the following:

$$\mathrm{FR}_{it} = \theta_1 \hat{FR}_{it} + \theta_2 \mathrm{elec}_{it} + \theta_3 \mathrm{elec}_{it} \times \hat{FR}_{it} + \theta_4 X_{it} + \alpha_i + \mathrm{trend}_i + \eta_{it} \qquad (2.3)$$

We instrument the interaction between election and fiscal rule by the interaction between election and $\hat{FR}$ as follows:

$$\text{elec}_{it} \times FR_{it} = \gamma_1 \text{elec}_{it} \times \hat{FR}_{it} + \gamma_2 \text{elec}_{it} + \gamma_3 \hat{FR}_{it} + \gamma_4 X_{it} + \alpha_i + \text{trend}_i + \xi_{it} \quad (2.4)$$

Note that η_{it} and ξ_{it} are the error terms of the first stage equations. This approach has several advantages. Firstly, it takes into account the binary nature of the endogenous fiscal rule dummy. Secondly, the usual IV standard errors are still asymptotically valid. Thirdly and most importantly, unlike the pseudo-IV approach (consisting in running an OLS estimate of Y on $\hat{FR}$), this approach does not require the Probit model to be correctly specified (Wooldridge, 2010). We just need the instrument (Neighbors_{it}) to be correlated with the probability of having a fiscal rule in place as specified in Equation (2.2). We employ the within IV estimator with clustered standard errors at country level which corrects the standard errors for arbitrary serial correlation.

2.2.2 Data description

We employ a cross-country panel dataset in order to test the effect of fiscal rules on the political budget cycle in developing countries. The dataset covers 67 developing countries over the period 1985-2007. The sample selection is based on data availability and we focus on fiscal rules adopted before the financial crisis of 2008-2009. Focusing on the adoption of fiscal rules prior to the crisis should reduce the selection-bias that may stem from the deterioration of the fiscal stance in many countries following this crisis. Indeed, many countries have adopted fiscal rules following the fiscal distress that characterizes the financial crisis of 2008-2009 (Schaechter *et al.*, 2012).

The sample includes 13 countries with national fiscal rules over the period among which 11 have Balanced Budget Rules (BBR), 4 have Expenditure Rules (ER), 7 have Debt Rules (DR) and only one have a Revenue Rule (RR).[4] Table 2.9 in Appendix shows the descriptive statistics of the variables used in the empirical work.

We focus on general government final consumption expenditure as share of GDP (from World Development Indicator, WDI) as the dependent fiscal variable of interest. Again, not only public expenditures are the most available fiscal variables especially for a long period of analysis in developing countries but also represent a good proxy for discretionary fiscal policy (Fatás and Mihov, 2003). In addition, Schuknecht (2000) finds that in developing countries, the main instrument of expansionary fiscal policies around elections is increasing public expenditures. Similarly, Block (2002) finds that fiscal expansions are pronounced in government consumption expenditure in a sample of African countries. Brender and Drazen (2005) also find that political budget cycles are driven by expenditure.

Data on fiscal rules are from the IMF (Fiscal rules dataset, 2012). Fiscal rules are defined according to Kopits and Symansky (1998) as a "permanent constraint on fiscal policy expressed in terms of a summary indicator of fiscal performance". Therefore, such a definition excludes fiscal targets that are subject to regular revisions. They are dummy variables indicating if in a specific year there is a fiscal rule in place.

Elections data are from the National Elections across Democracy and Autocracy (NELDA) database (Hyde and Marinov, 2011). The NELDA is a comprehensive database on national elections that provides precise informations on the date and the conditions in which these elections are held. We compute the election index following Franzese (2000) : $\text{elec} = \frac{(m-1)+\frac{d}{D}}{12}$ where m and d are respectively the month and the day in which the election takes place while D is the number of days of m.

[4] See Table 2.10 in Appendix for detailed information about these rules. As few developing countries have fiscal rules, this number of countries is comparable to other studies such as Tapsoba (2012). Many countries have combination of rules which is why the number does not add to 13.

The preelectoral index is obtained as $1 - elec$.[5] The election index allows to test more precisely the opportunistic cycle because it captures whether in a given year the incumbent has sufficient times to manipulate public spending before the election is held.

The macroeconomic controls are economic growth, trade openness, net public aid per capita, GDP per capita and lagged public debt. Real economic growth from the WDI captures business cycles fluctuations (see for instance Shi and svensson, 2006). Since more open economies may have larger public expenditures in order to cope with a higher degree of vulnerability to risk and to provide for higher need for social insurance (Rodrik, 1998), we control for the trade openness. As it is well-known that public aid relaxes the government's budget constraint by giving access to additional resources, we account for it in our empirical analysis. We control for real GDP per capita because as a consequence of the Wagner's Law, high income level may induce a greater demand for public services and so have a positive effect on public spending. We control for lagged public debt (as a share of GDP) because a high level of initial debt should lead to a reduction in public spending in order to satisfy the constraint of public debt sustainability (Wyplosz, 2002; Gali and Perotti, 2003).[6]

We include in addition to the macroeconomic controls, government fragmentation and the orientation of the party in power (right wing). The data are from the Database of Political Institutions (DPI). Government fragmentation is the probability that two deputies picked at random from the legislature will be of different parties. According to the "common pool" theory (Alesina and Drazen, 1991; Velasco, 2000; Talvi and Vègh, 2005) countries with a fragmented government should have higher public expenditure. Fiscal rules can then be viewed as a way of "tying the hands" of the government (Debrun *et al.*, 2008) and thus the fragmentation of the government

[5] We include the pre-electoral year in some specifications but they were not statistically significant and do not change the main results. We also use the electoral year dummies and the results remain similar.

[6] Lagged public debt is also a potential determinant of fiscal rules (Tapsoba, 2012).

can be positively correlated with the adoption of fiscal rules. But fragmented governments may also be characterized by centralized public expenditures (Jametti and Joanis, 2016). As the effect of centralization on the size of public spending is a priori ambiguous, the effect of government fragmentation on fiscal rule adoption is also a priori ambiguous.

Right wing is a dummy variable taking the value 1 if the party in power's orientation with respect to economic policy is defined as conservative, Christian democratic or right-wing and allows us to test for a partisan cycle. This variable may capture the fact that right wing governments are characterized by a fiscal conservatism. While right wing governments should have low levels of public spending the effect on fiscal rules' adoption is ambiguous a priori because they may have self discipline and may not need these rules but also may be in favor of such rules. Note that the control variables are based on the determinants of public spending that are also potential determinants of the adoption of fiscal rules (Calderón and Schmidt-Hebbel, 2008; Kumar *et al.*, 2009 and Tapsoba, 2012).

2.3 Results

We begin the presentation of our results by showing the first step of our empirical approach (that is the estimation of equation (2.2)), then we present the first stages (equations (2.3) and (2.4)) and finally results of equation (2.1) using OLS and IV.

2.3.1 The determinants of fiscal rules' adoption

Table 2.1 below, shows our results of the Probit estimation (equation 2.2), first step of our empirical approach. First it shows that the number of neighboring countries in the region with fiscal rules has a positive and statistically significant effect on the likelihood of a country to have these rules. This result is consistent with the diffusion mechanism that we outlined earlier and holds for the different types of fiscal

rules in the sample. In addition, the results are also broadly consistent with previous empirical works for the other determinants of fiscal rules. In particular, a good macroeconomic performance is positively correlated with the adoption of fiscal rules (Calderón and Schmidt-Hebbel, 2008 ; Kumar *et al.*, 2009 and Tapsoba, 2012). For instance, economic growth (Columns 1 and 2) and GDP per capita (column 4) are positively correlated with the likelihood of having fiscal rules and expenditure rules in particular, respectively. High inflation is negatively correlated with the presence of fiscal rules.

In addition, as foreign aid relaxes the budget constraint of the government, it is negatively correlated with the probability of having fiscal rules. Finally, Right wing governments have lower probability of adopting balanced budget rules and debt rules suggesting that the self-discipline effect mentioned earlier is dominant in our sample. These last two results, to our knowledge are novel.

2.3.2 Baseline results

We begin by focusing on the standard estimations common to the literature on political budget cycles. Recall that the dependent variable is the general government's public consumption. We provide estimations on all election years, "democratic" elections and elections that take place at constitutionally determined dates (hereafter, predetermined elections dates). Following Brender and Drazen (2005), elections are considered as "democratic" for the years of positive score of the Polity2 index.

Table 2.2 shows the first stage results (equations (2.3) and (2.4)) corresponding to the second stage estimates showed in Table 2.3. Again, since we have two endogenous variables (the fiscal rules dummy and the interaction term), there are two first stages. We instrument the interaction between election and fiscal rules by the interaction between election and the predicted probability $\hat{FR}$. Columns (1) to (3) show the first stage for the fiscal rule dummy (equation (2.3)) and Columns (4) to (6) show the first stage for the interaction term (equation (2.4)). Overall, all the instruments have a positive and statistically significant effect on the corresponding endogenous regressor consistently with the argument of regional diffusion of fiscal rules. The first stage F statistics of Angrist and Pischke (2009) and their associated p values allow us to reject the null that the instruments are weak (at a 5% level).

Table 2.1
Determinants of fiscal rule adoption

	(1) FR	(2) BBR	(3) DR	(4) ER
Neighbors	0.205***	0.200***	0.256***	0.296***
	(0.062)	(0.073)	(0.069)	(0.081)
Elec	0.250	-0.049	0.506**	-0.041
	(0.242)	(0.166)	(0.212)	(0.274)
Growth	0.037**	0.047***	0.002	0.037
	(0.016)	(0.017)	(0.021)	(0.023)
Openness (Log)	-0.116	-0.163	-0.008	-0.903**
	(0.304)	(0.379)	(0.260)	(0.423)
Inflation (Log)	-2.091**	-1.935*	-1.809**	-3.298
	(0.906)	(1.125)	(0.910)	(2.219)
Aid (Log)	-0.353***	-0.341***	-0.274**	-0.167
	(0.119)	(0.126)	(0.113)	(0.179)
Govern Fragmentation	-0.447	-0.562	0.234	-0.453
	(0.445)	(0.449)	(0.597)	(0.919)
Right wing	-0.288	-0.476*	-1.179**	0.099
	(0.281)	(0.271)	(0.475)	(0.363)
Public Debt (Log) (t−1)	-0.411	-0.121	-0.040	-0.704
	(0.298)	(0.344)	(0.326)	(0.478)
GDP Per Capita (log)	-0.107	-0.092	-0.228	0.703***
	(0.172)	(0.198)	(0.181)	(0.203)
Constant	11.887***	9.855**	8.693*	14.094
	(4.257)	(4.824)	(4.856)	(12.274)
Observations	1190	1190	1190	1190
Countries	67	67	67	67

Notes: Clustered Standard errors at country level in parentheses. FR= Fiscal rules dummy (all types), BBR = Balanced Budget Rules, DR = Debt Rules and ER= Expenditure Rules. Clustered Standard errors at country level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 2.3 shows the estimates of equation (2.1) using OLS and IV estimators. The results show that either considering all election years or democratic and "predetermined" election dates, fiscal rules have a negative and statistically significant effect on public consumption during election years. In addition, IV estimates of the effect of fiscal rules on political budget cycles are larger than OLS estimates. In column (1), the estimates suggest that in election years with fiscal rules, public consumption is reduced by 0.453% point of GDP. On the other hand, the corresponding effect from IV estimates in column (2) shows a reduction by 1.65% point of GDP.

The fact that IV estimates are larger than OLS estimates suggest that controlling for an omitted variable bias is not enough to deal with the endogeneity problem and that OLS tend to overestimate the effects of fiscal rules. The overestimation (by OLS) is consistent with the fact that countries with good macroeconomic conditions are more likely to adopt fiscal rules (Calderón and Schmidt-Hebbel, 2008 ; Kumar *et al.*, 2009 and Tapsoba, 2012) as showed in Table 2.1. Moreover, the magnitude of the effect (the coefficient of the interaction term being higher than the coefficient of election years in absolute term) is an interesting result. It suggests that political budget cycle in public spending may disappear or that we may be in presence of a fiscal discipline in election years when national fiscal rules are in place. Consistently with the theoretical result by Rose (2006), fiscal rules neutralize the political budget cycle as the incumbent no longer derives an electoral advantage from fiscal policy manipulation. This discipline effect is novel because previous analyses (Ebeke and Ölçer , 2013)) find a dampening effect.

Table 2.2
First stages

	(1) Base	(2) Dem	(3) Pred	(4) Base	(5) Dem	(6) Pred
$\hat{FR}$	0.714**	0.844**	0.737**	-0.021	0.032	-0.026
	(0.288)	(0.371)	(0.305)	(0.050)	(0.061)	(0.087)
Elec $\times \hat{FR}$	-0.216	-0.206		0.762**	0.810**	
	(0.203)	(0.244)		(0.366)	(0.412)	
Predet Elec $\times \hat{FR}$			-0.160			1.137**
			(0.218)			(0.492)
Elec	-0.005	-0.011		0.026	0.022	
	(0.011)	(0.013)		(0.038)	(0.039)	
Growth	-0.003**	-0.005**	-0.003**	-0.001*	-0.001*	0.000
	(0.001)	(0.002)	(0.001)	(0.000)	(0.001)	(0.001)
Openness (Log)	0.029	0.120	0.027	-0.003	0.007	-0.005
	(0.058)	(0.099)	(0.061)	(0.010)	(0.017)	(0.014)
Inflation (Log)	0.015*	0.013	0.016*	0.002	0.001	0.005
	(0.008)	(0.014)	(0.009)	(0.004)	(0.007)	(0.006)
Aid (Log)	0.039**	0.058***	0.039**	0.003	0.006	0.010*
	(0.017)	(0.022)	(0.017)	(0.004)	(0.005)	(0.006)
Govern Fragmentation	0.036	0.050	0.039	-0.006	-0.000	-0.003
	(0.059)	(0.078)	(0.061)	(0.013)	(0.016)	(0.016)
Right wing	-0.011	-0.004	-0.010	0.011*	0.011	0.035**
	(0.036)	(0.041)	(0.038)	(0.006)	(0.007)	(0.015)
Public Debt (Log) (t−1)	0.027	0.034	0.026	0.014**	0.011	0.024
	(0.024)	(0.032)	(0.026)	(0.007)	(0.009)	(0.015)
GDP Per Capita (log)	0.119	0.159	0.115	0.045**	0.067*	-0.012
	(0.103)	(0.191)	(0.109)	(0.022)	(0.036)	(0.032)
Predet Elec			-0.005			0.005
			(0.012)			(0.047)
Endogenous Elec			-0.047**			0.053
			(0.024)			(0.046)
Observations	1190	768	1146	1190	768	1146
Countries	67	51	64	67	51	64
F first Stage (fiscal rules)[c]	6.27	5.236	5.964			
p value F first Stage (fiscal rules)	0.014	0.026	0.017			
F first stage (interaction)[c]				7.66	8.71	7.653
p value F first stage (Interaction)				0.007	0.003	0.007

Notes: All Specifications include country-specific linear trends. The within estimator is used to eliminate the country fixed effects. Columns (1)-(3) show the first stage for fiscal rules and Columns (4)-(6) show the first stage for the interaction term. We instrument the interaction between election and fiscal rules by the interaction between election and the predicted probality $\hat{FR}$. Clustered Standard errors at country level in parentheses. Base = "all elections", Dem= "democratic elections" and Pred = "Predetermined election dates".
c: F test Angrist and Pischke (2009) for excluded instruments. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 2.3
Baseline results

	(1) Base (OLS)	(2) Base (IV)	(3) Dem (OLS)	(4) Dem (IV)	(5) Pred (OLS)	(6) Pred (IV)
Elec × FR	-1.032***	-2.360*	-1.063***	-3.506**		
	(0.349)	(1.259)	(0.289)	(1.567)		
Predet Elec × FR					-0.676***	-2.025*
					(0.241)	(1.057)
FR	-0.225	1.960	-0.394	1.144	-0.223	1.077
	(0.761)	(3.100)	(0.913)	(2.746)	(0.775)	(2.836)
Predet Elec					0.503**	0.646**
					(0.243)	(0.313)
Endogenous Elec					0.835	0.932*
					(0.511)	(0.516)
Elec	0.579***	0.714**	0.770***	1.041***		
	(0.214)	(0.285)	(0.231)	(0.312)		
Observations	1190	1190	768	768	1146	1146
Countries	67	67	51	51	64	64
F first Stage (fiscal rules)[c]		6.27		5.236		5.964
p value F first Stage (fiscal rules)		0.014		0.026		0.017
F first stage (interaction)[c]		7.66		8.71		7.653
p value F first stage (Interaction)		0.007		0.003		0.007

Notes: All Specifications include country-specific linear trends and the set of control variables. The within estimator is used to eliminate the country fixed effects. FR= Fiscal rules dummy (all types). Columns (1)-(2) show estimates for all elections and Pred = "Predetermined election dates". Columns (3)-(4) show estimates on the sub-sample of democratic countries and Columns (5)-(6) take into account the endogeneity of the electoral calendar. c: F test Angrist and Pischke (2009) for excluded instruments. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Also, Table 2.3 , column (4) shows the IV estimates focusing on the sub-sample of democratic elections. The effect of fiscal rules on the political budget cycle is larger than in column (2) that includes all elections. More specifically, public consumption is reduced by 2.46% point of GDP (while it is 1.65% point in the baseline). This result is consistent with Block (2002) and suggests that fiscal rules are more effective in democracies.

Indeed, the political costs of breaking these rules might be higher in democratic countries than in non democratic ones because of the high uncertainty about the probability of reelection in the former. In addition, democracies are characterized by a strong constraint on the executive that may complement fiscal rules in constraining fiscal discretion.

2.3.3 The design of fiscal rules, the experience with rules and the cycle

Now, we explore the effects of the institutional design, the type of rules and also whether the effect of fiscal rules varies as they become more entrenched.

Table 2.4 below shows our results for the institutional characteristics of rules. We consider features that may enhance the stringency of fiscal rules such as the availability of a mechanism of monitoring their compliance outside the government, the level of coverage (at the general government level). First, Table 2.4 shows that the monitoring of compliance outside the government and the coverage of the rule at the general government level matter for political budget cycles.[7] The previous comparison between OLS and IV estimates still holds. In column (2) and (4), the results show that public consumption is reduced by 1.876% point of GDP and 2.07% point of GDP in election years with fiscal rules respectively featuring a monitoring of compliance outside the government and fiscal rules covering the general government. This result is consistent with the traditional consideration that fiscal rules with a coverage at the general government level, are the most stringent (Schaechter *et al.*, 2012). Moreover, Nerlich and Reuter (2013) and Debrun and Kinda (2014) find that fiscal rules are strengthened by independent bodies monitoring their compliance. Also, the growing decentralization of public expenditures in developing countries is often seen as a threat to fiscal discipline (Fedelino and Ter-Minassian, 2010). Thus, fiscal rules constraining all levels of governments may help achieve fiscal discipline.

[7]The monitoring of compliance outside the government is in place if the database reports that there is an independent council monitoring the compliance with a given rule.

Table 2.4
Institutional features of the rules

	(1) MOG (OLS)	(2) MOG (IV)	(3) GG (OLS)	(4) GG (IV)
Elec × FR	-1.088***	-2.636**	-1.809***	-2.911**
	(0.418)	(1.280)	(0.553)	(1.406)
Elec	0.681***	0.760***	0.680***	0.841***
	(0.228)	(0.232)	(0.297)	
FR	-0.992	1.528	-2.054	7.693
	(0.966)	(4.284)	(1.623)	(14.066)
Observations	1029	1029	1002	1002
Countries	59	59	58	58
F first Stage (fiscal rules)[c]		4.23		3.062
p value F first Stage (fiscal rules)		0.044		0.08
F first stage (interaction)[c]		11.399		4.943
p value F first stage (Interaction)		0.000		0.03

Notes: All Specifications include country-specific linear trends and the set of control variables. The within estimator is used to eliminate the country fixed effects. FR= Fiscal rules dummy (all types), MOG: "Monitoring of compliance Outside the Government" and GG: "General Government". c: F test Angrist and Pischke (2009) for excluded instruments. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 2.5 presents our results for the type of rules in place. We report the results for Balanced Budget Rules (BBR), Debt Rules (DR) and Expenditure Rules (ER). The OLS estimates show that BBR are the type of rules that matter most for fiscal discipline in election years, as the marginal effect is larger. In column (1), public consumption is reduced by 0.968% point of GDP in election years with BBR in place while the effects for DR and ER are respectively 0.423% point of GDP and 0.388% point of GDP. This result is consistent with Rose (2006) who finds that stringent balanced budget rules dampen political budget cycles. However, the IV estimates show

that only expenditure rules do matter as they have a negative and statistically significant effect. In column (6), the results show that public consumption are reduced by 2.436% point during election years with expenditure rules in place. The findings on expenditure rules are consistent with Cordes *et al.* (2015) who show that the compliance rate for these rules are high. Also, as mentioned earlier, these results are broadly consistent with the fact that expenditure rules (and balanced budget rules) constrain fiscal policy in the short run, thus they should be more relevant for budget cycles. [8]

[8]Given the small sample variability, the IV results on the type of rules should be interpreted with caution.

Table 2.5
Type of rules

	(1) OLS	(2) IV	(3) OLS	(4) IV	(5) OLS	(6) IV
Elec × BBR	-1.514***	-4.176				
	(0.401)	(2.711)				
Elec × DR			-0.975***	-4.232		
			(0.298)	(3.173)		
Elec × ER					-0.886*	-3.036*
					(0.526)	(1.732)
Elec	0.546***	0.659**	0.552***	0.764**	0.498**	0.601**
	(0.205)	(0.268)	(0.208)	(0.328)	(0.207)	(0.244)
BBR	0.750	2.744				
	(0.705)	(4.304)				
DR			1.363	3.255		
			(0.937)	(4.340)		
ER					-2.267**	3.838
					(0.954)	(6.831)
Observations	1190	1190	1190	1190	1190	1190
Countries	67	67	67	67	67	67
F first Stage (fiscal rules)[c]		4.065		9.833		4.227
p value F first Stage (fiscal rules)		0.047		0.003		0.043
F first stage (interaction)[c]		3.438		4.223		3.595
p value F first stage (Interaction)		0.068		0.032		0.062

Notes: All Specifications include country-specific linear trends and the set of control variables. The within estimator is used to eliminate the country fixed effects. BBR = Blanced Budget Rules, DR = Debt Rules and ER= Expenditure Rules. Clustered Standard errors at country level in parentheses. c: F test Angrist and Pischke (2009) for excluded instruments. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Finally, we investigate the long term impact by exploring the effect of fiscal rules conditionally on the rank of elections. We focus on the two first elections since the adoption of fiscal rules because in our sample most of the rules are adopted over the last ten years of the period. Table 2.6 shows the results. The IV and OLS estimates are similar in showing that the effect of fiscal rules are stronger for the second election than for the first election. Fiscal rules do not have a statistically significant effect for the first election. This suggests that fiscal rules may be more effective in

constraining fiscal discretion as they become more entrenched and therefore more credible. IV estimates in Column (4) show that fiscal rules reduce public expenditure by 1.683% point of GDP in the second election.

Table 2.6
The long term impact of fiscal rules

	(1) FR1(OLS)	(2) FR2(OLS)	(3) FR1(IV)	(4) FR2(IV)
$\text{Elec}_1 \times \text{FR}$	-0.799		-1.893	
	(0.612)		(2.677)	
$\text{Elec}_2 \times \text{FR}$		-1.339*		-2.237***
		(0.712)		(0.585)
Elec	0.523**	0.520**	0.587**	0.554***
	(0.204)	(0.205)	(0.230)	(0.203)
FR	-0.255	-0.348	1.514	1.570
	(0.807)	(0.760)	(3.368)	(2.978)
Observations	1190	1190	1190	1190
Countries	67	67	67	67
F first Stage (fiscal rules)[c]			7.745	6.575
p value F first Stage (fiscal rules)			0.007	0.013
F first stage (interaction)[c]			1094.264	42.582
p value F first stage (interaction)			0.000	0.000

Notes: All Specifications include country-specific linear trends and the set of control variables. The within estimator is used to eliminate the country fixed effects. FR= Fiscal rules dummy (all types). $Elec_1$ and $Elec_2$ are respectively the first and the second election held while fiscal rules were in place. The indices 1 and 2 for the fiscal rules denote the first and the second election respectively. Clustered Standard errors at country level in parentheses. c: F test Angrist and Pischke (2009) for excluded instruments. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

2.4 Fiscal rules and the "resource curse" aspect of the budget cycle

Now we analyze the "resource curse" dimension of political budget cycles and the potential role for fiscal rules. Indeed, an important channel is the rent-seeking behavior of incumbents (Balland and François, 2000; Robinson *et al.*, 2006 and, Caselli and Cunningham, 2009). For instance, Robinson *et al.* (2006, 2014) show that natural resource booms by raising the value of being in power induce politicians to use public revenues to bribe voters. They can offer public employment to voters and this will induce am increase in public consumption.

Resource wealth may therefore exacerbate the political budget cycle in public consumption. It may provide the incumbent with resources that can be used for patronage on one hand and by raising the value of being in power on the other other hand. In this vein, Vergne (2009) finds that countries with large natural resource production are characterized by a large distortion in public consumption during election years. Also, Klomp and De Haan (2016) find that incumbents increase natural resource rents during elections to expand public spending.

In order to investigate the role of fiscal rules in mitigating the "resource curse" channel of the political budget cycle, we follow Andersen *et al.*(2017) in defining resource rich countries. We define resource rich countries as countries with an average total resource rents representing at least 5% of GDP over the period.[9] Resource-rich dominate the sample. In our sample, there are 56 countries that meet this definition among which only 4 have fiscal rules in place over the period. These four countries are Ecuador, Indonesia, Mexico and Peru.

[9]The data on natural resource rents are from the WDI. The World Bank defines the rent as the difference between the unit price and the unit cost multiplied by the production. The natural resources are: bauxite, coal, copper, forest, natural gas, gold, iron ore, lead, nickel, oil, phosphate, silver, tin and zinc.

We estimate the following equation:

$$Y_{it} = \eta_1 \text{elec}_{it} \times FR_{it} \times \text{Res Rich}_i + \eta_2 \text{elec}_{it} \times FR_{it} + \eta_3 FR_{it} \times \text{Res Rich}_i + \eta_4 \text{elec}_{it} \times \text{Res Rich}_i + \eta_5 \text{elec}_{it} \times FR_{it} + \eta_6 FR_{it} + \eta_7 X_{it} + \alpha_i + \text{trend}_i + \varepsilon_{it} \quad (2.5)$$

Where Res Rich$_i$ is a dummy variable capturing whether a country is rich in natural resources. Note that we do not include Res Rich$_i$ in equation (2.5) because its effect is already accounted for by the country fixed effect (α_i). The coefficients of interest are η_1, η_2 and η_4. They respectively capture the effect of fiscal rules on political budget cycles for resource-rich countries, the effect of fiscal rules on the budget cycle and the budget cycle in resource rich countries.

Table 2.7 shows the results. First of all, across all specifications, fiscal rules still have a mitigating effect on the political budget cycle in public consumption. These effects are similar to the baseline estimates. For instance, in column (2), public consumption is reduced by 1.9% of GDP during election years with fiscal rules in place. Second, the political budget cycle is stronger in resource-rich countries (than in the others). In column (4), the public consumption is higher during election years in resource rich countries by 1.46% of GDP. Finally, the effect of fiscal rules on the political budget cycle in resource rich countries is only statistically significant in column (1). The coefficient are negative but the estimates are not precise. This can be explained by the fact that only 4 resource-rich countries have fiscal rules in place.

Overall, we find evidence of a stronger political budget cycle in public consumption for resource-rich countries consistently with the literature (Vergne, 2009; Klomp and De Haan, 2016). The evidence for a role for fiscal rules in resource-rich countries is rather weak. We mostly fail to reject the null that fiscal rules do not matter for political budget cycles in resource-rich countries. However, as we do not have a large number of resource-rich countries in our sample we cannot conclude on the ineffectiveness of rules in this contest.

Table 2.7
Fiscal rules and the "resource curse" aspect of the budget cycle

	(1) Base (OLS)	(2) Base (IV)	(3) Dem (OLS)	(4) Dem (IV)	(5) Pred (OLS)	(6) Pred (IV)
Elec × FR	-0.691*	-1.945**	-0.835***	-2.465***		
	(0.355)	(0.887)	(0.258)	(0.649)		
Predet Elec × FR					-0.558*	-1.292***
					(0.290)	(0.492)
Elec × FR × Res Rich	-1.346**	-4.033	-1.079	-8.531		
	(0.663)	(6.352)	(0.680)	(10.564)		
Predet Elec × FR × Res Rich					-0.473	-5.513
					(0.626)	(6.494)
FR × Res Rich	0.926	3.273	2.123	2.532	0.839	-0.718
	(1.210)	(9.088)	(1.364)	(9.298)	(1.238)	(8.009)
Elec × Res Rich	0.785*	0.859	1.026*	1.461*		
	(0.424)	(0.636)	(0.559)	(0.809)		
Predet Elec × Res Rich					1.489***	1.889***
					(0.452)	(0.603)
FR	-0.473	0.853	-1.043	0.552	-0.456	0.986
	(0.987)	(3.131)	(1.150)	(2.887)	(1.007)	(3.139)
Predet Elec					0.076	0.163
					(0.255)	(0.299)
Endogenous Elec					0.837*	0.902*
					(0.508)	(0.503)
Elec	0.330	0.479*	0.477***	0.699***		
	(0.224)	(0.273)	(0.179)	(0.198)		
Observations	1190	1190	768	768	1146	1146
Countries	67	67	51	51	64	64
F first Stage (fiscal rules)[c]		12.536		11.548		10.334
p value F first Stage (fiscal rules)		0.001		0.001		0.002
F first stage (interaction: FR*Elec)[c]		15.277		14.608		15.390
p value F first stage (Interaction: FR*Elec)		0.000		0.000		0.000
F first stage (interaction: FR*Elec* Res Rich)[c]		9.780		11.263		13.246
p value F first stage (Interaction: FR*Elec* Res Rich)		0.003		0.002		0.001
F first stage (interaction: FR*Res Rich)[c]		8.239		7.722		6.909
p value F first stage (Interaction: FR*Res Rich)		0.006		0.008		0.011

Notes: All Specifications include country-specific linear trends and the set of control variables. The within estimator is used to eliminate the country fixed effects. FR= Fiscal rules dummy (all types). Columns (1)-(2) show estimates for all elections and Pred = "Predetermined election dates". Columns (3)-(4) show estimates on the sub-sample of democratic countries and Columns (5)-(6) take into account the endogeneity of the electoral calendar. c: F test Angrist and Pischke (2009) for excluded instruments. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

2.5 Robustness: Testing for over-identification

In this section, we augment our previous empirical strategy by an additional instrumental variable in order to be able to test for overidentifying restrictions. We take advantage of a continuous measure of fiscal rules. We use fiscal rules strength index from Schaechter *et al.*(2012). This index is also referred to as a stringency index and it is based on key indicators of fiscal rules such as: the legal basis, the coverage, the existence of formal enforcement procedure, expenditure ceilings, fiscal responsibility laws and the existence of an independent body setting budget assumption and monitoring the budget implementation.[10]

Our additional instrumental variable is inspired by Ayuso-i-Casals *et al.* (2007). We use the (one year) lagged value of the fiscal rule index to capture persistence in the legislative process. We therefore develop an instrumental variable strategy that combines our baseline approach (accounting for the endogeneity of the adoption) with the persistence of rules. As mentioned earlier, it allows us to test for over-identifying restrictions. Table 2.8 shows similar results to the baseline. Fiscal rules dampen the political budget cycle. In addition, in all estimates, we cannot reject at any conventional level the null of the validity of overidentifying restrictions, and we reject the null of weak identification at all conventional level.

[10]For more details, see Schaechter *et al.* (2012).

Table 2.8
Testing for over-identification

	(1) Base (OLS)	(2) (Base (2SLS)	(3) Base (LIML)	(4) Dem (OLS)	(5) Dem (2SLS)	(6) Dem (LIML)	(7) Pred (OLS)	(8) Pred (2SLS)	(9) Pred (LIML)
Elec × FR index	-0.304***	-0.224**	-0.224**	-0.236**	-0.182*	-0.182*			
	(0.112)	(0.113)	(0.113)	(0.112)	(0.111)	(0.111)			
Predet Elec × FR index							-0.306***	-0.225**	-0.225**
							(0.110)	(0.111)	(0.111)
FR index	0.106	0.037	0.037	-0.035	-0.257	-0.258	0.101	0.025	0.025
	(0.314)	(0.453)	(0.454)	(0.338)	(0.499)	(0.500)	(0.311)	(0.447)	(0.448)
Predet Elec							0.526**	0.506**	0.506**
							(0.251)	(0.254)	(0.254)
Endogenous Elec							0.533	0.529	0.529
							(0.502)	(0.500)	(0.500)
Elec	0.534**	0.516**	0.516**	0.600**	0.575**	0.574**			
	(0.228)	(0.230)	(0.230)	(0.252)	(0.251)	(0.250)			
Observations	1079	1079	1079	702	702	702	1079	1079	1079
Countries	66	66	66	50	50	50	66	66	66
p value F first Stage (fiscal rules)[c]		0.000	0.000		0.000	0.000		0.000	0.000
p value F first stage (Interaction)[c]		0.000	0.000		0.000	0.000		0.000	0.000
p value SW chi2		0.000	0.000		0.000	0.000		0.000	0.000
p value SW chi2 (interaction)		0.000	0.000		0.000	0.000		0.000	0.000
p value Hansen j Statistic		0.401	0.401		0.341	0.341		0.429	0.429

Notes: All Specifications include country-specific linear trends and the set of control variables. The within estimator is used to eliminate the country fixed effects. FR index is Fiscal rules index (all types). Columns (1)-(3) show estimates for all elections and Pred = "Predetermined election dates". Columns (4)-(6) show estimates on the sub-sample of democratic countries and Columns (7)-(9) take into account the endogeneity of the electoral calendar. c: p value F test (weak identification) Sanderson and Windmeijer (2015) for excluded instruments. p value SW chi2 is the p value of Sanderson and Windmeijer (2015) test for under-identification (H0: the endogenous variable is unidentified). LIML is the Limited Maximum Likelihood estimator. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

2.6 Conclusion

We exploit the geographical pattern in the adoption of fiscal rules to empirically investigate whether the constraint that fiscal rules may impose on discretionary fiscal policy are binding during election years. Using a sample of developing countries, we find that fiscal rules matter for fiscal discipline. In addition, some specific features of fiscal rules are particularly relevant to achieve fiscal discipline. Expenditure rules, rules targeting all levels of government and rules that are monitored by an independent body outside the government lead to fiscal discipline over the electoral cycle. Furthermore, we find also that fiscal rules are more effective in constraining political budget cycles the longer they are in place. It suggests that escape clauses should be well defined in order to avoid changing or amending too often fiscal rules and thus undermining their credibility in the long run.

We also investigate the "resource curse" aspect of the budget cycle. While we find that the political budget cycle is particularly strong in resource-rich countries, we do not find robust evidence on the role for fiscal rules in this regard. In addition, we augment our baseline empirical strategy by exploiting an index of the strength of fiscal rules. In this augmented approach, we combine our baseline strategy (accounting for the endogeneity of the adoption) with the persistence in the legislative process. We find that fiscal rules still have a causal effect on the political budget cycle and we cannot reject the null of the validity of over-identifying restrictions.

Our empirical analysis provides a novel identification strategy in order to estimate the causal effect of fiscal rules. Our findings have interesting implications regarding the design of fiscal rules in increasingly decentralized developing countries. In this regard, fiscal rules should target the general government.

Previous studies emphasize that political budget cycles are a symptom of the divergence between political incentives and social welfare maximization and that the aggressive use of fiscal policy discretion induce macroeconomic volatility (Fatás and Mihov, 2003). Fiscal rules may therefore play an important role in reducing macroeconomic volatility by curbing politically motivated public expenditures in developing countries.

2.7 Appendix Chapter 2

Countries in the sample

Argentina, Bangladesh , Barbados, Belize, Bolivia, Botswana, Brazil, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Colombia, Congo Dem. Rep., Costa Rica, Cote d'Ivoire, Dominican Republic, Ecuador, Egypt, El Salvador, Ethiopia, Fiji, Gabon, Gambia, Ghana, Guinea-Bissau, Honduras, India, Indonesia, Iran, Islamic Rep., Jamaica, Jordan, Kenya, Lesotho, Liberia, Madagascar, Malawi, Malaysia, Mali, Mauritius, Mexico, Morocco, Mozambique, Nepal, Nicaragua, Niger, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Rwanda, Senegal, Sri Lanka, Suriname, Syrian Arab Republic, Tanzania, Thailand, Togo, Tunisia, Turkey, Uganda, Uruguay, Venezuela, Zambia, Zimbabwe.

Table 2.9
Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
General government consumption in % of GDP (WDI)	1190	13.867	5.361	2.976	41.659
Elec (NELDA)	1190	0.102	0.247	0	0.997
FR (IMF Fiscal rules dataset, 2012)	1190	0.074	0.262	0	1
FR index (IMF Fiscal rules dataset, 2012)	1080	0.151	0.616	0	4.055
Growth (WDI)	1190	1.596	4.52	-32.235	16.236
Log Openness in % of GDP (WDI)	1190	4.087	0.535	2.382	5.395
Log (100+Inflation)	1190	4.784	0.414	4.481	10.107
Aid per capita (Log) (WDI)	1190	3.016	1.301	-2.381	5.58
Government fragmentation (DPI)	1190	0.172	0.262	0	0.893
Right wing (DPI)	1190	0.23	0.421	0	1
Public debt in % of GDP (Log) $(t-1)$ (Abbas *et al.*, 2010)	1190	4.159	0.585	1.717	6.26
GDP per capita (Log) (WDI)	1190	6.916	1.138	4.567	9.189
Polity2 (Polity IV Database, Marshall & Jaggers, 2005)	1136	2.347	6.265	-9	10
Neighbors	1190	1.019	1.615	0	6
Res Rich (WDI)	1190	0.327	0.469	0	1

Table 2.10
Year of adoptions and features of the rules

Country	ER	BBR	DR	RR	Monitoring	Coverage
Argentina	2000	2000			BBR (Yes) ER (No)	GG
Botswana	2003				No	CG
Brazil	2000		2000		Yes	GG
Costa Rica		2001			Yes	CG
Ecuador		2003	2003		Yes	BBR (CG) DR (GG)
India		2004			No	CG
Indonesia		1967	2004		No	GG
Kenya			1997	1997	No	CG
Mexico		2006			Yes	CG
Pakistan		2005	2005		No	CG
Panama		2002-2003	2002-2003		No	GG
Peru	2000	2000			BBR(Yes) ER(No)	CG
Sri Lanka			2003	2003	No	CG

BBR = Balanced Budget Rule, DR = Debt Rule , ER= Expenditure Rule, RR= Revenue Rule, CG=Central government, GG=General Governent. Monitoring (Monitoring of Compliance outside the government). Panama's rules were in place for only 2 years.
Source: Schaechter *et al.* (2012)

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Chapter 3

A LEADERSHIP CURSE? OIL PRICE SHOCKS AND THE SELECTION OF NATIONAL LEADERS

"No society can run effective public institutions while ignoring the quality of who is recruited to public office [...]" (Besley, 2005)

Introduction

Les ressources naturelles représentent une formidable opportunité pour la prospérité économique. Pourtant, Sachs et Warner (2001) montrent que les pays riches en ressources ont tendance à croître à un rythme plus lent que leurs homologues moins dotés en ressources naturelles. Comme discuté dans les chapitres précédents, les ressources naturelles peuvent affecter les finances publiques négativement. Les facteurs politiques sont parmi les principales raisons du «paradoxe de l'abondance» (Karl, 1999), également connu sous le nom de « malédiction des ressources naturelles » (Sachs et Warner, 2001).[1] L'objet principal de la littérature sur les fondements politiques de la « malédiction des ressources naturelles » est de comprendre comment les ressources naturelles peuvent interagir avec les incitations de ceux qui sont au pouvoir (Acemoglu, Robinson et Verdier, 2004; Acemoglu et Robinson, 2006; Robinson, Torvik, et Verdier, 2006; Caselli et Tesei, 2011).[2] Robinson et *et*

[1] Voir Van der Ploeg (2011), Van Der Ploeg et Poelhekke (2017) pour une revue sur la littérature et d'autres explications de la « malédiction des ressources naturelles ».

[2] Voir aussi Caselli et Cunningham (2009) qui fournissent un cadre théorique en forme réduite qui se consacre à l'analyse du comportement du leader dans un environnement riche en ressources naturelles. Un champ de la littérature analyse également les effets des ressources naturelles sur l'instabilité politique (guerres civiles), par exemple Collier et Hoeffler (2004), Lei et Michael (2014); Berman, Couttenier, Rohner et Thoenig (à venir).

al. (2006) font valoir, que les booms des ressources naturelles incitent les politiciens à une mauvaise allocation des ressources dans l'économie, en augmentant la valeur du temps passé au pouvoir et en fournissant aux politiciens plus de ressources qu'ils peuvent utiliser pour acheter les votes.

Dans ce chapitre, nous contribuons aux fondements politiques de la « malédiction des ressources naturelles » en étudiant si la richesse en ressources naturelles affecte la «qualité» des individus qui arrivent au pouvoir. Des recherches empiriques antérieures montrent que la sélection politique, c'est-à-dire celui qui est choisi pour diriger, joue un rôle important dans l'élaboration des politiques (Pande, 2003; Chattopadhyay et Duflo, 2004; Jones et Olken, 2005; Dreher, Lamla, Lein et Somogyi, 2006; Besley *et al.*, 2011). [3] Les dirigeants politiques influent également sur la croissance économique. [4] En lien étroit avec ce chapitre, Besley *et al.* (2011) fournissent des preuves montrant que la croissance économique après la mort d'un leader national est fonction de son niveau d'éducation : une transition d'un leader avec une qualification d'études supérieures à un leader sans diplôme d'études supérieures conduit à une réduction moyenne de la croissance autour de 2,1 % par an au cours de la période de cinq ans après la transition.

[3]En effet, Besley (2005) souligne que la sélection politique est importante parce que la crédibilité de l'engagement politique et le contrôle électoral des politiciens sont limités. Ainsi, Pande (2003) constate que les représentants législatifs issus de minorités choisissent des politiques ciblées sur leurs propres groupes. Dans la même direction, Chattopadhyay et Duflo (2004) montrent que le genre des leaders est important dans les choix politiques. En particulier, les femmes politiques investissent davantage dans les infrastructures publiques qui sont directement liées aux besoins de leur propre genre, comme les projets d'accès à l'eau.

[4]À cet égard, Jones et Olken (2005) trouvent que les changements aléatoires de dirigeants nationaux découlant de leur décès affectent de manière significative la croissance économique (en particulier dans les autocraties). Leurs résultats suggèrent que leurs caractéristiques personnelles sont importantes.

Ils montrent que «les leaders éduqués sont déterminants». Plus récemment, Martinez-Bravo (2017) montre que les leaders villageois les mieux éduqués en Indonésie ont contribué à l'augmentation de la fourniture des biens publics. [5]

Question de recherche

À la lumière de cette littérature sur l'importance du leadership pour la croissance économique et compte tenu du puzzle de la « malédiction des ressources naturelles », la question suivante se pose : la qualité des dirigeants pourrait-elle expliquer la « malédiction des ressources naturelles »? Si les booms des ressources naturelles réduisent la probabilité de choisir un leader éduqué et compétent, ces booms peuvent réduire la croissance économique future. En effet, les retombées des ressources peuvent affecter la sélection politique en affectant différemment le coût d'opportunité et la rémunération des acteurs du secteur public pour les citoyens hautement qualifiés et moins éduqués. Par exemple, si les retombées des ressources génèrent des rémunérations élevées pour les carrières dans le secteur privé (caractérisé par la récompense du capital humain et des compétences), les citoyens hautement qualifiés pourraient être découragés à briguer un mandat public.

En outre, comme il est bien connu que les dirigeants ont tendance à demeurer longtemps au pouvoir dans les pays riches en ressources naturelles, la qualité de la sélection politique peut être cruciale pour le développement économique. La « malédiction des ressources naturelles » pourrait donc avoir certaines origines dans la compétence des individus choisis pour diriger le pays. En effet, «alors que les mauvaises politiques et la corruption ont des causes multiples, quiconque accorde une attention intermittente aux informations politiques des pays les plus défavorisés et les plus corrompus ne peut manquer de percevoir que la qualité médiocre de la

[5]Voir aussi Dreher *et al.* (2006) qui montrent que les antécédents professionnels des dirigeants nationaux déterminent la mise en place des réformes favorables à la croissance telles que la libéralisation.

classe politique est l'une d'entre elles» , (Caselli et Morelli, 2004).[6] Par exemple, en 2004, le magazine Forbes a classé Mohamed Suharto, président de l'Indonésie (pendant la période 1967-1998) qui n'avait qu'un niveau d'éducation secondaire, en tant que le leader le plus corrompu au monde. [7]

Nous mettons en évidence dans ce chapitre, un canal politique de la « malédiction des ressources naturelles » qui ne repose pas sur la façon dont les ressources naturelles affectent les incitations des politiciens au pouvoir. L'accent est mis plutôt sur l'influence des ressources naturelles sur la «qualité» de dirigeants nationaux avant leur arrivée au pouvoir. En d'autres termes, nous étudions les effets de sélection négative des ressources naturelles plutôt que les effets d'aléa moral en politique, suivant la terminologie de Besley (2006). À notre connaissance, ce chapitre est le premier à étudier empiriquement si les chocs des prix du pétrole peuvent réduire les chances de choisir des dirigeants nationaux compétents. Afin d'étudier cet effet de sélection négative, nous utilisons un ensemble de macro-données couvrant 111 pays (en développement et avancés) au cours de la période 1930-2004. Les données comprennent plus de 700 leaders nationaux et leurs caractéristiques personnelles telles que leur niveau de scolarité et leur ancien métier.

Méthodologie et résultats

Nous utilisons une approche en double différence pour étudier si les changements dans les prix du pétrole brut ont un effet inégal sur la probabilité de choisir un leader national ayant un niveau élevé d'éducation dans les pays ayant des réserves importantes de pétrole ou de grands gisements en pétrole. Cette stratégie d'identification exploite la variation de la richesse en pétrole induite par la variation des prix du

[6]Traduction libre de l'anglais.

[7]Il aurait détourné entre 15 et 35 milliards de dollars dans un pays avec un revenu par habitant de 695 USD (Transparency International Global Corruption Report 2004).

pétrole. Nous trouvons que les chocs positifs des prix du pétrole réduisent considérablement la probabilité de choisir un leader national avec un niveau d'études graduées ou un niveau de scolarité universitaire dans les pays riches en pétrole par rapport aux pays non pétroliers. En particulier, l'augmentation de 182 % des variations des prix du pétrole au cours de la période a entraîné une réduction allant de 11,8 % à 20,79 % de la probabilité de choisir un leader national avec un diplôme ou un niveau de scolarité collégial en moyenne pour un pays riche en pétrole. Les résultats sont robustes à diverses analyses de sensibilité. Par exemple, en enquêtant sur les transitions violentes en tant que mécanisme potentiel de la malédiction du leadership, nous trouvons que les chocs positifs du prix du pétrole réduisent la probabilité de choisir un ancien militaire en tant que leader national. Dans le même ordre d'idées, les résultats sont solides à l'exclusion de leaders arrivés au pouvoir par coup d'État. Ces résultats suggèrent que la malédiction du leadership ne semble pas provenir de transitions violentes menées par des militaires (ou des individus) moins éduqués pendant les booms pétroliers.

Ensuite, nous étudions les sources potentielles d'hétérogénéité dans l'échantillon. Premièrement, nous examinons si l'arrangement constitutionnel et les règles électorales qui régissent le jeu politique sont importants. Nous constatons à cet égard que l'effet des chocs positifs du prix du pétrole est deux fois plus important respectivement dans les régimes présidentiels et dans les pays sous une règle de vote proportionnelle que dans le résultat de référence (13,62 %). Cependant, la malédiction du leadership n'est pas statistiquement significative dans les régimes parlementaires. Ces résultats sont compatibles avec Andersen et Aslasken (2008) qui constatent que la « malédiction des ressources naturelles » est plus prononcée dans les pays avec un régime présidentiel ou une représentation proportionnelle car ils peuvent être caractérisés par la recherche de rentes (Kucinová et Rose-Ackerman, 2005).

De plus, comme les divisions ethniques sont essentielles à l'économie politique de nombreux pays en développement, nous explorons également la pertinence de la fragmentation ethnique qui mesure la probabilité que deux individus sélectionnés au

hasard n'appartiennent pas au même groupe ethnique. Les résultats montrent que la malédiction du leadership provient des pays en développement à forte fragmentation ethnique car les estimations ne sont pas statistiquement significatives pour les pays à revenu élevé et pour les pays en développement caractérisés par un faible niveau de fragmentation ethnique. La rentabilité potentielle élevée de la politique de favoritisme, c'est-à-dire l'achat de votes dans des pays riches en ressources naturelles et ethniquement fragmentés (Collier, 2007) peut avoir des implications importantes pour la qualité du leadership. [8]

Nous proposons ensuite un cadre théorique inspiré par Dal Bó *et al.* (2006) dans le but d'éclairer le résultat selon lequel la malédiction du leadership provient des pays en développement ethniquement fragmentés. Le modèle présente l'interaction entre un futur leader national et une coalition de chefs des groupes ethniques. La coalition offre un soutien électoral à un candidat en échange de faveurs futures. Afin de garantir qu'une fois que le candidat devient le leader, il tienne parole, la coalition spécifie une menace de coup d'État ou de révolution dans le cadre de cet accord. L'intuition est semblable à celle de Francois, Rainer et Trebbi (2015) qui montrent que la menace de révolution et des coups d'État constitue la force motrice derrière la répartition des postes ministériels entre les groupes ethniques dans les gouvernements africains. Les deux instruments (soutien électoral et menace de coups d'État) sont des compléments. Le mécanisme de la malédiction du leadership est le suivant. La grande richesse pétrolière génère une forte demande de redistribution, ce qu'on appelle l'effet de «voracité» (Tornell et Lane, 1999), qui, si elle n'est pas satisfaite, peut conduire à une révolution. Un choc positif du prix du pétrole rend donc crédible la menace des coups ou de la révolution qui est similaire à une taxe sur la rémunération obtenue une fois au pouvoir. Cette situation dissuade donc la candidature des citoyens hautement qualifiés qui préfèrent rester dans le secteur privé.

[8] Collier (2007) souligne que dans les pays riches en ressources naturelles, les politiques de favoritisme peuvent être rentables parce que les politiciens n'ont qu'à convaincre les leaders des groupes ethniques.

Littérature associée

Ce chapitre complète la littérature sur les fondements politiques de la « malédiction des ressources naturelles » mentionnée précédemment en revenant au moment de la sélection et, par conséquent, à la «qualité» des dirigeants nationaux juste avant que ces derniers commencent à gouverner. Le chapitre est étroitement lié à deux études au niveau microéconomique (Brollo, Nannicini, Perotti, and Tabellini, 2013; Carreri et Dube, 2015). Brollo *et al.* (2013) étudient l'effet des transferts fédéraux vers les gouvernements municipaux sur la corruption et la «qualité» des candidats opposés au maire dans les élections municipales brésiliennes. Ils constatent que de gros transferts augmentent la corruption et réduisent l'éducation moyenne des candidats. Mais, Brollo *et al.* (2013) se concentrent sur la façon dont les chances de réélection du titulaire augmentent (même s'il détourne des fonds publics) parce qu'il se heurte à des challengers de «qualité» faibles. Dans ce chapitre, nous étudions plutôt l'implication des chocs de prix du pétrole pour la «qualité» des leaders nationaux nouvellement sélectionnés.

Carreri et Dube (2017) montrent que les chocs positifs du prix du pétrole tendent à augmenter l'arrivée au pouvoir des législateurs pro paramilitaires et à réduire la concurrence électorale (car l'augmentation de la violence paramilitaire peut dissuader les candidatures) dans les municipalités colombiennes les plus dépendantes du pétrole. Alors que Carreri et Dube (2017) étudient l'effet des chocs du prix du pétrole sur le type de politicien qui arrive au pouvoir, la différence est qu'ils se concentrent sur un aspect partisan de la sélection politique dans un contexte de violence. Ce chapitre se concentre sur la «qualité» des leaders nationaux, mesurée par le niveau d'éducation. En outre, l'aspect macroéconomique de notre recherche nous permet d'aborder la question de l'effet des ressources naturelles sur la sélection politique à l'échelle mondiale et ce n'est pas spécifique à un pays, comme dans les deux travaux de niveau microéconomique susmentionnés.

Ce chapitre est également relié à une littérature croissante qui vise à comprendre les déterminants de la sélection politique. [9] Dans un modèle citoyen-candidat, Caselli et Morelli (2004) montrent que, même lorsque les électeurs préfèrent des politiciens de «bonne qualité» , ils peuvent finir par choisir des leaders de «mauvaise qualité» en raison de la pénurie de candidats de «bonne qualité» et du fait que les mauvais politiciens ont un faible coût d'opportunité. Le chapitre contribue à cette littérature en montrant que les chocs du prix du pétrole peuvent avoir une influence sur qui vient au pouvoir.

Le reste du chapitre est organisé comme suit. La section 3.2 décrit les données, la section 3.3 explique la méthodologie empirique et la section 3.4 présente le principal résultat empirique, discute de sa robustesse de diverses manières et étudie les hétérogénéités. La section 3.5 étudie si les ressources minérales peuvent également générer une malédiction de leadership. La section 3.6 fournit une discussion théorique sur le mécanisme causal de la malédiction du leadership. Enfin, la section 3.7 conclut.

[9] Voir Braendle (2014) pour une revue de la littérature sur les déterminants institutionnels de la sélection politique.

3.1 Introduction

Natural resources represent a tremendous opportunity for economic prosperity. Yet, seminal work by Sachs and Warner (2001) shows that resource-rich countries tend to grow at a slower rate than their counterparts less endowed in natural resources. Political factors are among the key reasons behind the "paradox of plenty" (Karl, 1999) also known as the "resource curse" (Sachs and Warner, 2001).[10] The main focus of the literature on the political foundations of the "resource curse" is on understanding how natural resource wealth distorts the incentives of those in power (Acemoglu, Robinson and Verdier, 2004; Acemoglu and Robinson, 2006; Robinson, Torvik, and Verdier, 2006; Caselli and Tesei, 2011).[11] Robinson *et al.* (2006) argue, for instance, that natural resource booms induce politicians to mis-allocate resources in the economy, by raising the value of being in power and by providing politicians with more resources which they can use to bribe voters.

In this chapter, I add to the political foundations of the "resource curse" by studying whether natural resource wealth affects the "quality" of individuals that come to power. Previous empirical research show that political selection, i.e who is in charge, plays an important role in shaping policies (Pande, 2003; Chattopadhyay and Duflo, 2004; Jones and Olken, 2005; Dreher, Lamla, Lein and Somogyi, 2006;

[10] See Van der Ploeg (2011) and, Van Der Ploeg and Poelhekke (2017) for a review on the large literature and other explanations of the "resource curse".

[11] See also Caselli and Cunningham (2009) who provide a reduced form theoretical framework that is dedicated to the analysis of the leader's behavior in a resource-rich environment. A strand of the literature also analyzes the effects of natural resources on political instability (civil conflicts)-see for instance Collier and Hoeffler (2004), Lei and Michael (2014); Berman, Couttenier, Rohner and Thoenig (Forthcoming).

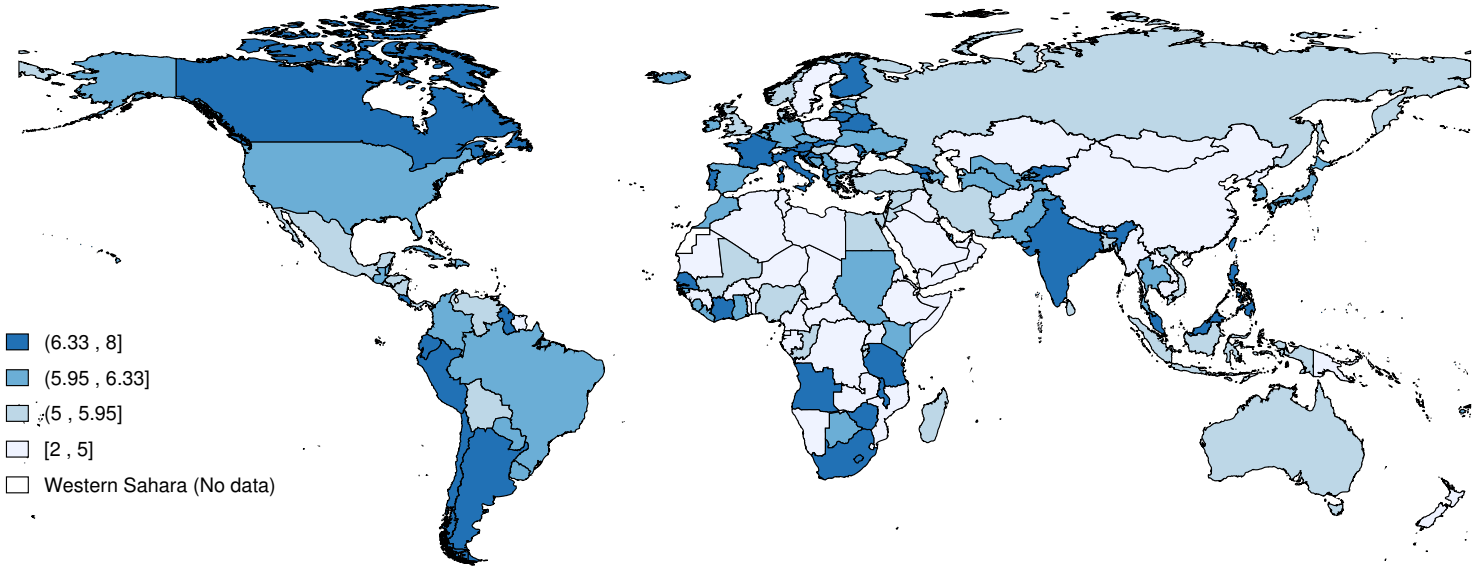
and Besley *et al.* 2011).[12] Leaders also affect economic growth.[13] Closely related to this chapter, Besley *et al.* (2011) provide evidence showing that economic growth after a leader's death varies with the leader's educational attainment : a transition from a leader with a post-graduate qualification to a leader without a post-graduate qualification yields an average reduction in growth around 2.1% per year over the five years post-transition period. They show that "educated leaders matter". More recently, Martinez-Bravo (2017) shows that better educated village leaders in Indonesia have contributed to the increase in the provision of public goods.[14]

[12]Indeed, Besley (2005) outlines that political selection is important because policy commitment and the electoral control of politicians are limited. Consistently, Pande (2003) finds that legislative representatives from minority casts choose policies targeted toward their own groups. In the same direction, Chattopadhyay and Duflo (2004) show that the gender matters for policy choices. In particular, selected female politicians invest more in public infrastructures that are directly relevant to the needs of their own gender such as water projects.

[13]In this regard, Jones and Olken (2005) find that random changes in national leaders stemming from their death significantly affect economic growth (especially in autocracies). Their findings suggest that their personal characteristics matter.

[14]See also Dreher *et al.*(2006) who show that the professional background of national leaders matter for pro-growth reforms such as market liberalization. Figure 3.1 describes the average education of national leaders across countries. This map also shows that there is a significant variation in the average level of education of national leaders across countries. For instance, within Africa, the most economically successful countries (South Africa, Ghana) tend to be governed by highly educated national leaders on average over the period. Although it does not imply any causal relationship, it suggests that a national leader's education may be (positively) correlated with the country's economic performance.

Figure 3.1
Average level of education of national leaders over the period 1930-2004



Notes : 2 (literate with no formal education), 3 (primary school or taught by personal tutors), 4 (secondary or trade school), 5 (special training beyond high school), 6 (College), 7 (Master degree), 8 (PhD).
Data source : Besley and Reynal-Querol (2011), author's calculations.

In light of this literature on the importance of leadership for economic growth and considering the "resource curse" puzzle, the following question arises : Could the quality of leaders explain the "resource curse "? If resource booms reduce the likelihood of selecting an educated leader with a high expected competence, then these booms may reduce future economic growth. Indeed, resource windfalls may affect political selection by affecting differently the opportunity cost of, and the reward from public office for highly educated and less educated citizens. For instance, if resource windfalls generate high rewards from pursuing a career in the private sector (characterized by the reward of human capital and skills), highly educated citizens could be discouraged from seeking public office.

Moreover, as it is well-known that leaders tend to last in power in resource-rich countries, the quality of political selection may be crucial for economic development. The "resource curse " could have therefore some of its origins in who is selected to lead the country. Indeed, "while bad policies and corruption have multiple causes, anyone who pays even intermittent attention to the political news from the worst performing and the most corrupt countries, cannot fail to perceive that low quality of the political class is one of them", (Caselli and Morelli, 2004). For instance, in 2004, Forbes magazine ranked Mohamed Suharto, the president of Indonesia (over the period 1967-1998) who had only attended secondary school, as the world's all-time most corrupt leader.[15]

This chapter highlights a political channel of the "resource curse" that is not based on how natural resources affect the incentives of politicians while in power. The focus is rather on the influence of natural resources on the "quality" of selected national leaders. In other words I study the adverse selection effects of natural resources rather than the moral hazard effects in politics, following Besley (2006)'s terminology. To the best of my knowledge, this chapter is the first to empirically investigate whether oil price shocks may reduce the chances of selecting national leaders with a

[15]He allegedly embezzled between 15 and 35 billions USD in a country with an income per capita of 695 USD (Transparency International Global Corruption Report 2004).

high expected competence. In order to investigate this adverse selection effect, I use a cross-country macroeconomic panel dataset covering 111 countries (developing and advanced) over the period 1930-2004. The data include more than 700 national leaders and their personal characteristics such as their level of education and former profession.

I employ a difference-in-differences approach to investigate whether the changes in crude oil prices have an unequal effect on the probability of selecting a national leader with a high level of education in countries with important oil reserves or oil endowments. This identification strategy exploits the variation in oil wealth induced by the change in oil prices. I find that positive oil price shocks reduce significantly the probability of selecting a national leader with a graduate level or a college level of education in oil-rich countries relatively to non-oil countries. In particular, the 182% increase in the changes in oil prices over the period, led to a reduction ranging between 11.8% and 20.79% in the probability of selecting a national leader with a graduate or a college level of education for the average oil-rich country. The results are robust to various sensitivity analyses. For instance, in investigating violent transitions as a potential mechanism of the leadership curse, I find that positive oil price shocks reduce the probability of selecting a former military as a national leader. In the same vein, the results are robust to the exclusion of coup leaders. These findings suggest that the leadership curse does not seem to stem from violent transitions led by less educated military (or individuals) during booms.

Next, I investigate potential sources of heterogeneity in the sample. First, I explore whether the constitutional arrangement and the electoral rules that govern the political game matter. I find that the effect of positive oil price shocks is twice and thrice larger respectively in presidential regimes and in countries under a proportional voting rule than in the baseline result (of 13.62%).

However, the leadership curse is not statistically significant in parliamentary regimes. These results are consistent with Andersen and Aslasken (2008) who find that the "resource curse" is more pronounced in countries under a presidential regime or a proportional representation as they may be characterized by rent-seeking (Kucinová and Rose-Ackerman, 2005).

In addition, as ethnic divides are central to the political economy of many developing countries, I explore also the relevance of ethnic fragmentation which measures the probability that two randomly selected individuals do not belong to the same ethnic group. I find that the leadership curse is driven by ethnically fragmented developing countries as the estimates are not statistically significant for high income countries and for developing countries characterized by a low level of ethnic fragmentation. The potential high cost-effectiveness of patronage politics, i.e vote buying in ethnically fragmented resource-rich countries (Collier, 2007) may have important implications for the quality of leadership.[16]

I provide a theoretical framework inspired by Dal Bó *et al.* (2006) with the aim to shed light on the finding that the leadership curse is driven by ethnically fragmented developing countries. The model features the interaction between a prospective national leader and a coalition of ethnic chiefs. The coalition offers an electoral support to a candidate in exchange for future favors once the latter takes office. In order to guarantee that once the candidate becomes the leader, he respects the deal, the coalition specifies a threat of coups or revolution as part of this deal. The intuition is similar to Francois, Rainer and Trebbi (2015) who show that the threat of revolution and coups is the driving force behind the allocation of ministerial post among ethnic groups in African governments. The two instruments (electoral support and the threat of coups) are complements. The mechanism of the leadership curse is as follows. The large oil wealth generates a strong demand for re-distributions, the so-called "voracity effect" (Tornell and Lane, 1999), which if not satisfied may lead

[16]Collier (2007) emphasizes that in ethnically fragmented resource-rich countries, patronage politics may be cost-effective because politicians need only to bribe ethnic leaders.

to a revolution. A positive oil price shock makes therefore the threat of coups or revolution credible which is similar to a tax on the reward from office. This situation therefore deter the candidacy of highly educated citizens who prefer to stay in the private sector.

This chapter complements the literature on the political foundations of the "resource curse" mentioned earlier by going back to the moment of the selection and hence, the "quality" of national leaders just before they begin to govern. The chapter is closely related to two micro levels studies (Brollo, Nannicini, Perotti, and Tabellini, 2013; Carreri and Dube, 2015). Brollo *et al.* (2013) study the effect of federal transfers to municipal governments on corruption and the "quality" of opponents candidates to the incumbent mayor in Brazilian municipalities. They find that large transfers increase corruption and reduce the average education of the candidates. But, Brollo *et al.* (2013) focus on how the chances of reelection of the incumbent increase (even if he grabs rents) because he faces low "quality" challengers. In this chapter, I rather study the implication of oil price shocks for the "quality" of the newly selected national leaders.

Carreri and Dube (2017) show that positive oil price shocks tend to increase pro-paramilitary legislators' rise to power and to reduce electoral competition (because increased paramilitary violence may deter candidacy) in more oil dependent Colombian municipalities. While Carreri and Dube (2017) study the effect of oil price shocks on the type of politician who comes to power, the difference is that they are focused on a partisan aspect of political selection in a context of violence. This chapter is focused on the "quality" of selected national leaders measured as the level of education. Also, the macroeconomic aspect of my work allows me to tackle the issue of the effect of natural resources on political selection at a global scale and it is not case-specific as in the two aforementioned microeconomic level papers.

This chapter relates also to a growing literature that aims at understanding the determinants of political selection.[17] In a citizen-candidate model, Caselli and Morelli (2004) show that even when voters prefer high "quality" politicians, they can end up selecting low "quality" leaders because of a shortage of high "quality" candidates and the fact that bad politicians have low opportunity costs. The chapter contributes to this literature by showing that oil price shocks can have an influence on who comes to power.

The remainder of the chapter is organized as follows. Section 3.2 describes the data, section 3.3 explains the empirical methodology and Section 3.4 presents the main empirical finding, discusses it robustness in various ways and investigates heterogeneities. Section 3.5 investigates whether mineral resources can also generate a leadership curse. Section 3.6 provides a theoretical discussion on the causal mechanism of the leadership curse. Finally section 3.7 concludes.

3.2 Data

I exploit a unique cross-country panel dataset containing 111 countries (from all levels of development) over the period 1930-2004 to explore whether oil price shocks affect the quality of political selection.[18] The panel data is unbalanced because not all countries were independent at the beginning of the sample period. Countries in the sample are selected only on the basis of the availability of the relevant data for the empirical analysis. Given the length of the time series and the varied set of countries, I include a small set of relevant variables in order to avoid sacrificing too many observations. Table 3.13 in appendix shows the descriptive statistics. Detailed information about the variables follow.

[17] See Braendle (2014) for a survey of the literature on the institutional determinants of political selection.

[18] The period of analysis is constrained by the availability of oil data.

Oil abundance and oil price

My main measure of oil abundance is oil reserves. The data are from Cotet and Tsui (2013). It is measured in millions barrels per 100 000 persons. Oil reserves are calculated as the difference between the cumulative discoveries and cumulative productions. As oil wealth in any point in time is directly proportional to the stock of oil reserves (Miller and Upton, 1985), I calculate the average over the period. I employ also a measure of initial oil endowment in hundred of millions of barrels as a proxy for oil abundance. These data are also taken from Cotet and Tsui (2013). Oil endowment is estimated by geologists based on extensive studies of the exogenous geological characteristics of the countries. This measure of oil abundance is a good alternative to oil reserves because the latter are determined by past explorations and extractions rates which could be endogenous to political institutions (Robinson *et al.*, 2006). I use these two alternative measures of oil abundance in the empirical analysis. Figure 3.5 in Appendix shows the distribution of the initial oil endowment across geographical areas.

Crude Oil price per barrel series are taken from BP Statistical Review of World Energy June 2010. I use both the nominal prices series (Dollar price of the day) and the real oil price series (in 1990 USD). I transform the time series by taking the natural log, then obtain the first difference before merging with the cross-country dataset. The oil prices and oil reserves data are used to compute the oil price shock as detailed in the empirical approach. This measure of oil price shock captures mainly an oil wealth effect. Overall, the sample contains 57 countries without oil and 54 oil countries.

Personal characteristics of national leaders

All the data on the personal characteristics of national leaders are taken from Besley and Reynal-Querol (2011). National leaders are the heads of governments (the prime minister in parliamentary regimes and the president in presidential regimes). This

definition of a national leader is consistent with Archigos (Goemans *et al.*, 2006).[19] National leaders are included the first time that they are selected. The main personal characteristic of the leaders of interest in this paper is their level of education. Besley (2005) considers that honesty and competence are the two principal dimensions of the quality of political leaders. The level of education is a good proxy of competence as it captures the quality of human capital of the leader. Also, the level of education of leaders has a significant effect on economic growth (Besley *et al.*, 2011). In addition, education attainment enhance skills and signals ability (Besley and Reynal-Querol, 2011).[20] Besides, education is also strongly correlated with civic engagement (Dee, 2004 and Milligan *et al.*, 2004).

The dataset includes 713 national leaders.[21] Besley *et al.* (2011) classify the level of education of the national leaders into 8 categories. The level of education varies from category 1 to 8, where higher discrete values correspond to higher levels of education. The category 1 includes illiterate national leaders. Leaders with no formal education are classified in category 2. The national leaders in the category 3 have grade or elementary or primary school education or benefited from the teaching of personal tutors. In category 4 are leaders with a high school or finishing secondary school education or trade school level of education. Category 5 national leaders are those with special training (beyond high school) in areas such as mechanical, nursing, art, music, or military school. The leaders with a college education are classified in category 6, while leaders with a graduate level of education (Master degree) and those with a doctorate are respectively classified in category 7 and 8. In the empirical analysis, following Besley *et al.* (2011) I consider the leaders in categories 6 to 8 as leaders with a high level education.

[19] Archigos is a database on national leaders especially focusd on how they take and leave power.

[20] See for instance Yu and Jong-A-Pin (2016) who use the level of education of national leaders as a proxy for economic competence.

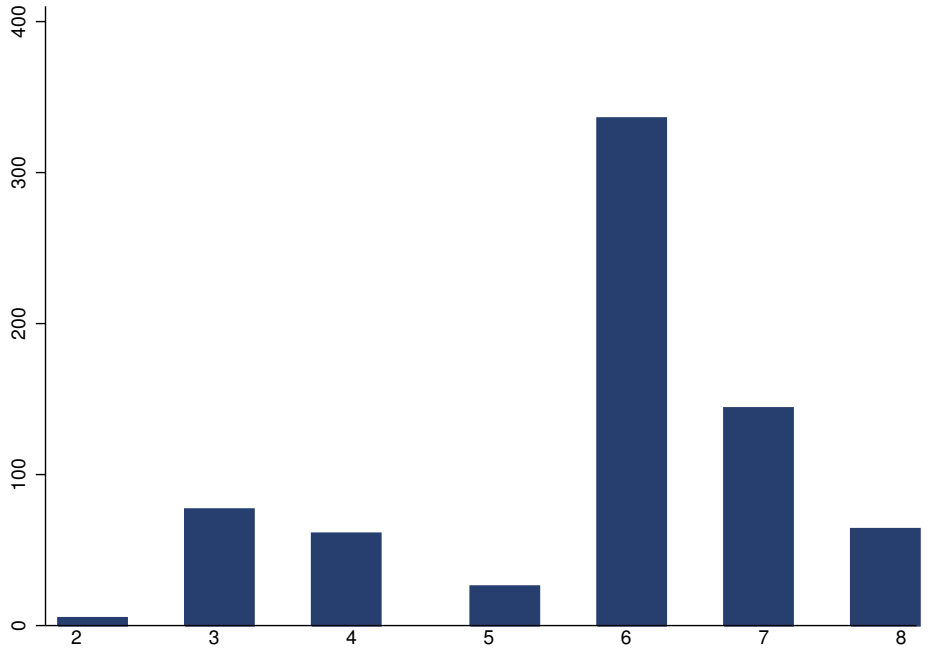
[21] I use only the high quality data and for which oil data are available.

I use a dummy variable variable taking the value 1 for leaders in categories 7 and 8 , and 0 otherwise that captures graduate level of education. I also use a second dummy variable to capture a college degree of education taking the value 1 for categories greater or equal to 6 and 0 otherwise.

Finally, in addition to the absolute measure of the level of education of the leader, I employ also a measure that captures the level of education of the leader relative to the average level of education in the country. This measure of educational distance is the difference between the number of the years of education of the national leader and the average number of years of education of the population. Figure 3.2 shows a description of the different educational categories of national leaders in the sample. It shows that the sample contains only literate national leaders. There are 388 college educated leaders and only 10 literate leaders with no formal education.

The data on the professional background of national leaders are also available. The three categories of professions are : Dummy variables for Lawyers, military and, professors and scientists. In some specifications I test whether the professional background of the national leader matters. Information on how national leaders take power are also available. Archigos (Goemans *et al.*, 2006) codes the entry of a national leader either as regular or as irregular depending on the pre-established political institutions and the selection mechanism in place in a given country. A leader's entry is classified as regular if it is in line with these institutions. For instance, in democracies a leader may be selected through election or through a coalition of representatives in the legislature. Also, an hereditary succession in a monarchy is classified as regular. Regarding irregular as opposed to regular entries, they embody different aspects. They correspond to coups or assassination and any other means that are not consistent with the political institutions governing political transitions in the country.

Figure 3.2
Distribution of leaders across educational categories



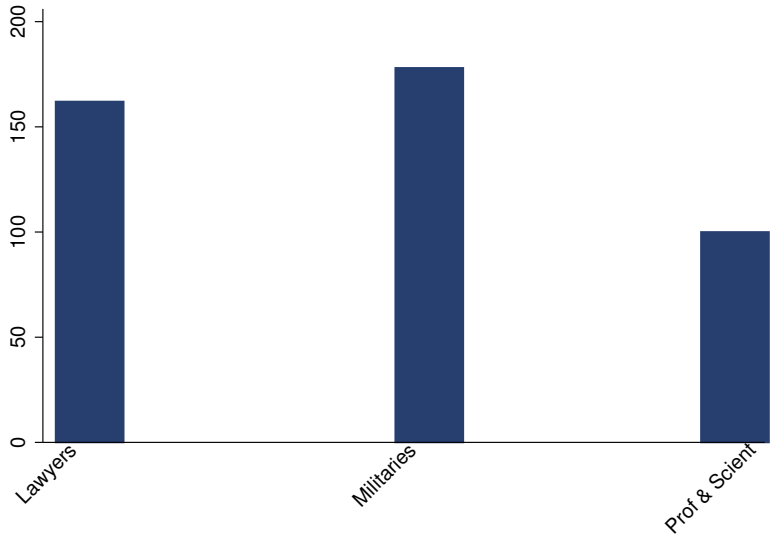
Notes : 2 (literate with no formal education), 3 (primary school or taught by personal tutors), 4 (secondary or trade school), 5 (special training beyond high school), 6 (College), 7 (Master degree), 8 (PhD).
Data source : Besley and Reynal-Querol (2011), author's calculations.

In addition, a more precise indicator of how a leader comes to power is a dummy variable that takes the value of 1 if elected and 0 otherwise. I use also a dummy variable capturing coup leaders. These variables are useful in the empirical analysis for robustness checks and to test for potential mechanisms. Almost 80 % of the leaders came in power through regular means, 60 % of leaders were elected and only 14 % of the leaders ceased power through a coup.[22] Figure 3.3 shows the data on the 440 national leaders for whom I have the information on the professional background.

[22]The information on elected and coup leaders are not available for all the 713 national leaders in the sample.

The sample is composed of 162 lawyers, 100 professors and scientists and 178 professional military.

Figure 3.3
Distribution of leaders in Professional categories



Notes : Professional backgrounds are respectively Lawyers, Military and Professors & Scientists
Data source : Besley and Reynal-Querol (2011), author's calculations.

Democracy

I use the polity2 index from the polity IV database (Marshall and Jaggers, 2005) to take into account the level of democracy in the country. The polity 2 index is comprised between -10 and 10 with higher scores meaning more democratic political institutions. The overall score is based on sub-scores for the constraints on the chief executive, the competitiveness of political participation, and the openness and the competitiveness of executive recruitment. Thus this index captures various dimensions related to the political selection of national leaders. Indeed, Besley and Reynal-Querol (2011) find that democratic countries select more educated leaders.

GDP per capita

GDP per capita data come from Maddison (2003) and is the main macroeconomic control available for a large number of countries and the over the period of analysis. Besley and Reynal-Querol (2011) argue for GDP per capita as a proxy for income that could capture the opportunity cost of national leaders. This interpretation is particularly interesting as I exploit a within-country variation in the empirical analysis.

Education level of the population

The data on the country-level education attainment is taken from Besley and Reynal-Querol (2011). They compile data on the average years of education of the population over 15 from Morrison and Murtin (2010) and the data on average years of education of the population over 25 from Barro and Lee (2001). As the data provide information only over every decade and for every five years respectively they impute missing information by a linear extrapolation. The data is available for few countries and generates a significant loss in the size of the sample. I employ these variables only in robustness checks. Besley and Reynal-Querol (2011) control for

the average level of education in the population because they are concerned about a potential omitted variable bias as democracy is correlated to the level of education. However controlling for the average level of education could capture the average level of education of the pool of candidates as well. Also, if the level of education in oil-rich countries tend to be low (Gyfalson, 2001), it is important to take it into account in the empirical analysis.

3.3 Empirical Approach

The empirical strategy follows Dube and Vargas (2013). I use a difference-in-differences approach by exploring whether the changes in oil prices have a disproportionate effect on the probability of selecting a national leader of a high level of education in countries with large oil reserves. This strategy uses the cross-sectional variation based on oil reserves distribution across different countries and the time variation coming from movements in the annual change of oil prices. Let Educated_{lct} be a measure of the level of education of a national leader l in country c taking power in year t. In order to test whether the realization of a positive oil price shock in year t reduces the probability of selecting a new leader of high level of education in country c in the same year, I estimate the following equation : [23]

$$\text{Educated}_{lct} = \beta_1(\text{Oil abundance}_c \times \Delta\ln(\text{Price}_t)) + \beta_2 X_{ct} + \beta_3 X'_{lct} + \delta_c + \delta_t + \text{trend}_c + \xi_{lct} \tag{3.1}$$

Where $\text{Oil abundance}_c \times \Delta\ln(\text{Price}_t)$ is a measure of oil price shocks (with Oil abundance_c the average oil reserve over the period), X_{ct} a set of control variables, δ_c a country fixed effect, δ_t is a year effect, trend_c is a country-specific

[23] In addition, I employ an alternative strategy that does not use the non-oil countries in the sample and therefore focuses on oil-rich countries (See Table 3.7). I also provide in Appendix (Table 3.23) an estimation without the inclusion of the interaction term to show that the controls still have the same effects.

linear trend and ξ_{lct} is an error term. In some specifications, I include leaders professional backgrounds (X'_{lct}). Countries fixed effects help remove all time invariant unobserved countries heterogeneities such as the geographical concentration of oil wealth, history and culture of selection that may have an influence on the outcome of interest. The year effects control for changes common to all countries within the same year such as global macroeconomic trends. The country-specific (linear) trends are included in some specifications as controls for time-varying omitted variables (such as political events) and serial correlations.

In the baseline estimates, following Besley and Reynal-Querol (2011), I measure the level of education as dummy variable that takes the value 1 when the leader has a graduate level of education. I also employ alternative measures of educations in the robustness checks. Note that the specification does not include Oil abundance$_c$ and $\Delta\ln(\text{Price}_t)$ because their respective effects are already accounted for by the country-fixed effects and the year effects. The coefficient of interest is β_1 and I test $\beta_1 < 0$, meaning that positive oil price shocks reduce the probability of selecting a national leader with a high level of education. In addition, β_1 captures the differential effect of the change in oil prices (between the selection year and the year before) on the probability of selecting a leader of high level of education in countries characterized by oil abundance.

Following Besley and Reynal-Querol (2011), all the variables including the oil shocks are measured in the year in which the leader is selected. Note that as I employ the first difference of the oil price series, $\Delta\ln(\text{Price}_t)$ captures the change in oil prices between the year of selection and the year before. My measure of oil shock is similar to the approach in empirical research both at macroeconomic (cross-country) level (Brückner, Ciccone and Tesei, 2012; Brückner, Chong and Gradstein, 2012) and microeconomic level (Acemoglu *et al.*, 2013; Dube and Vargas, 2013).[24] Brückner,

[24]Brückner, Ciccone and Tesei (2012); Brückner, Chong and Gradstein (2012) instrument GDP per capita (in a cross-country) analysis by oil price shocks while Acemoglu *et al.* (2013) use the same

Ciccone and Tesei (2012) and Brückner, Chong and Gradstein (2012) use the average share of net oil exports in GDP as a measure of oil abundance to construct their oil price shocks. Acemoglu *et al.* (2013) employ initial oil reserves in the US economic sub-regions while Dube and Vargas (2013) use a time-invariant oil production at municipal level in Colombia as a measure of oil abundance.

In this paper I employ the average level of oil reserves over the period as the main proxy for oil abundance. I do not use Oil extraction or production because it may be correlated with political factors (Bohn and Deacon, 2000 and Robinson *et al.*, 2006). This strategy is also related to the approach used in the literature on commodity price shocks (Deaton, 1999 and Brückner and Ciconne, 2010). The time invariant measure of oil abundance is not endogenous to policy change that may possibly take place in response to price change (Deaton, 1999). Finally, I use alternatively nominal and real oil prices in the empirical analysis. Taking the first difference in oil prices deals with the well-known presence of unit-root in oil price series in level (Hamilton, 2009; Brückner, Ciccone and Tesei, 2012; and Brückner, Chong and Gradstein, 2012).

Based on the exploitation of similar measures of oil price shocks at macroeconomic level as instruments (Brückner, Ciccone and Tesei, 2012; and Brückner, Chong and Gradstein, 2012) my specification could then be interpreted as a reduced form. Indeed, while just identified instrumental variable estimates are median-unbiased, reduced forms are unbiased because they are OLS estimates (Angrist and Krueger, 2001). However, I acknowledge that it is also arguable that some countries with significant market power can have an influence on the spot oil price. Regarding this potential source of endogeneity, as mentioned earlier, I use the annual change in time series of oil price and this should be less endogenous than the price in level. Indeed the changes in oil prices are nearly unpredictable (Hamilton, 2009).

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approach and instrument local area income by oil price shocks. Dube and Vargas (2013) estimate the effect of oil price shocks on civil conflicts in Colombian municipalities.

Also, It is difficult given my outcome variable of interest and the fact that I focus on newly selected leaders (who should not have any significant influence on the changes in oil prices) to argue that they could manipulate the prices. Omitted variables bias concerns should also be addressed by the inclusion of the country-specific trends. Finally, as shown by Kilian (2009) demand side shocks play more important roles than supply side shocks in the determination of oil prices. However, in order to be sure that the results are not drained by countries that may have the power to control international prices, I control for the OPEC membership in robustness checks. I estimate equation (3.1) mainly by OLS with clustered standard errors at the country-level in order to correct for arbitrary serial correlation.[25]

3.4 Empirical results

Now I present the main empirical finding followed by various robustness analyses.

3.4.1 Baseline results

Table 3.1 shows the estimates of equation (3.1). All the estimates show a negative and statistically significant effect of oil price shocks on the probability of selecting a national leader with a graduate level of education. My preferred estimates are column (6) as they include all the baseline control variables. In order to grasp the magnitude of the effect, note (from summary statistics, Table 3.13 in Appendix) that the changes in oil prices rise by 1.82 log point over the period 1930-2004. For the average oil-rich country in the sample (with oil reserves of 0.15 millions barrels per 100.000 persons), these changes in the oil prices reduce the probability of selecting a national leader with a graduate level of education by 13.62% relatively to a non-oil country.

[25] In the Appendix, I show estimates for unconditional Probit and Logit with dummies as Katz (2001) and Coupé (2005) suggest that they yield estimates similar to the true parameters. In the Appendix I use also other maximum likelihood estimators such as Ordered Logit and ordered Probit.

These results show that positive oil price shocks reduce significantly the probability of selecting a national leader with a high expected competence. As educated leaders matter for growth (Besley *et al.* 2011), the reduced probability of having them could be interpreted as an increased probability of having a resource curse. Moreover, it has become an empirical regularity that leaders tend to last in power in resource-rich countries. It is therefore important to select educated or competent leaders. In addition, the effect of the control variables have the expected signs as in Besley and Reynal-Querol (2011). In particular, democracies tend to select more educated leaders. The results are robust to the inclusion of Democracy suggesting that positive oil price shocks do not reduce the quality of selected leaders by inducing less democracy (Tsui, 2011).

Table 3.1
Oil shocks and the selection of a national leader with a Graduate level of education

Dependent variable : Graduate level of education	(1)	(2)	(3)	(4)	(5)	(6)
Oil reserve $\times$ Δln(Oil Price)	-0.343**	-0.427**	-0.411***	-0.464***	-0.410***	-0.499***
	(0.157)	(0.179)	(0.153)	(0.168)	(0.153)	(0.158)
Democracy			0.018***	0.022***	0.019***	0.021***
			(0.004)	(0.005)	(0.004)	(0.005)
GDP per capita (Log)					0.005	-0.285***
					(0.075)	(0.108)
Country specific trends	No	Yes	No	Yes	No	Yes
Observations	713	713	713	713	713	713
Countries	111	111	111	111	111	111

Notes : All specifications include year dummies and country fixed effects. Clustered Standard errors at country level in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

3.4.2 Robustness of the results

I carry out various tests in order to assess the robustness of the main empirical finding. First, I employ alternative measures of oil abundance (oil endowment), the

educational attainment of the national leader (college level and education index) and the oil price series to ensure that the results do not depend upon on measurement issues. Second, a potential concern is the possibility that less educated leaders may cease power through violent channels such as coups in periods of resource booms. In this regard, I provide estimates showing that the results do not stem from low quality leaders that takes the power by force.

Third, another concern is the fact that resource-rich countries are characterized by low level of education (Gyfalson, 2001). It may therefore be important to control for the level of education of the population in order to test for a potential omitted variable bias. The inclusion of country-specific trends should address this concern but I take precaution to control for the average year of education in the population and the professional background of the national leader. Indeed, some professional backgrounds imply more years of education than others. Another way to deal with this is to use a measure of education relative the level of education in the population (see Table 3.24 in Appendix). Controlling for the average level of education of the population may also capture the average level of education of the pool of (potential) candidates.[26] Finally, I also estimate another specification focusing on oil countries only.[27]

[26]Another possibility is that oil revenues may contribute to raise the level of education of leaders (in the long run) if they are used to increase public expenditure in education. For instance, Martinez-Bravo (2017) documents a large program of school construction in Indonesia funded by oil revenues and that had contributed in the long run in an increase in the education of village leaders. Controlling for the average level of education in the population accounts also for this potential long term effect.

[27]Additional robustness analyses are presented in Tables 3.14 to 3.28 with associated Figures 3.6 and 3.7 in the Appendix including the exploitation of the cross-sectional variation (pooled estimations), Maximum Likelihood estimations, controlling for OPEC membership, focusing on the post World War II period (1950-2004), excluding the 1973 and 1979 oil shocks, over the period 1960 - 2004, using a measure of educational distance between the national leader and the population, and using time-varying oil reserves instead of the average.

Table 3.2
Oil endowment and the selection of educated national leaders

Dependent variable : Graduate level of education	(1)	(2)	(3)	(4)	(5)	(6)
Oil initial endowment × Δln(Oil Price)	-0.278*	-0.310**	-0.323**	-0.356**	-0.323**	-0.381***
	(0.142)	(0.158)	(0.134)	(0.142)	(0.135)	(0.124)
Democracy			0.018***	0.022***	0.019***	0.022***
			(0.004)	(0.005)	(0.004)	(0.005)
GDP per capita (Log)					0.008	-0.286***
					(0.075)	(0.108)
Country specific trends	No	Yes	No	Yes	No	Yes
Observations	713	713	713	713	713	713
Countries	111	111	111	111	111	111

Notes : All specifications include year dummies and country fixed effects. Clustered Standard errors at country level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3.2 shows the results for the definition of oil abundance as the initial oil endowment. All specifications show consistently with the baseline results, a negative and statistically significant effect of oil price shocks. In column (6), the estimates suggest that for the average oil-rich or oil-endowed country (with oil reserves of 0.3 millions barrels per 100.000 persons) the change in oil prices over the period reduces the probability of selecting a national leader with a graduate level of education by 20.79% (roughly 21%) comparatively to a non oil-endowed country. The results from Table 3.2 are in line with the baseline results and show the robustness of the leadership curse to the measure of oil abundance.

Table 3.3 tackles another potential measurement issue by using alternative measures of the level of education of the national leader. As Figure 3.2 shows, the sample includes a large number of national leaders with a college level of education. In columns (1)-(6), I redefine therefore a leader of high level of education as a leader with at least a college level of education (categories 6 to 8). In columns (7)-(12), I use the education index that includes all levels of education of the national leaders. First of all, the results still depict a negative and statistically significant effect of

oil price shocks on the level of education of selected national leaders. The result in column (6) implies that for the average oil-rich country, the change in oil prices over the period reduces the probability of selecting a national leader with a college level of education by 16.94% compared to a non oil-rich country. In column (12) the estimates suggest that for the average oil-rich country, the change in oil prices over the period reduces the education index by 0.55 as compared to a non oil-rich country. This effect is equivalent to a differential reduction of 9.26% in the average education index.

Table 3.3
Oil shocks and Education measurements

Dependent variable :	College level of education						Education Index					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Oil reserve × Δln(Oil Price)	-0.399***	-0.577***	-0.430***	-0.593***	-0.429***	-0.621***	-1.145**	-1.834***	-1.294***	-1.918***	-1.285***	-2.031***
	(0.124)	(0.149)	(0.127)	(0.149)	(0.130)	(0.135)	(0.474)	(0.520)	(0.471)	(0.505)	(0.478)	(0.450)
Democracy			0.008**	0.010**	0.008**	0.009**			0.040***	0.050***	0.041***	0.049***
			(0.004)	(0.004)	(0.004)	(0.004)			(0.011)	(0.011)	(0.011)	(0.011)
GDP per capita (Log)					0.003	-0.233*					0.046	-0.923**
					(0.067)	(0.133)					(0.258)	(0.389)
Country specific trends	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	713	713	713	713	713	713	713	713	713	713	713	713
Countries	111	111	111	111	111	111	111	111	111	111	111	111

Notes : Education index is the indicator comprising education categories 2 to 8. All specifications include year dummies and country fixed effects. Clustered Standard errors at country level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3.4 is dedicated to another measurement issue by analyzing the effects of nominal oil prices rather than the real oil price series (in 1990 USD) used so far. In columns (1)-(6), I separate positive price changes from negative ones to disentangle the effects of positive price shocks from the effects of negative price shocks. This procedure allows me to test for a potential asymmetric effect. The results show that only positive shocks have a negative and statistically significant effect. In particular, column (6) shows that for the average oil-rich country the change in oil prices over the period reduces the probability of selecting a national leader with a graduate level of education by 11.80% compared to a non-oil country. In addition, negative price shocks do not have a statistically significant effect. Columns (7)-(12) show comparable estimates to the baseline results using the nominal oil price series. In column (12), the result shows a reduction of 12.57% in the probability of a selecting a national leader with a graduate level of education for an average oil-rich country comparatively to a non-oil country. These results are also close to the baseline estimates.

Table 3.4
Nominal oil prices and the selection of a national leader with a Graduate level of education

Dependent variable : Graduate level of education	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Oil reserve $\times \Delta^{+}$ln(Nominal Oil Price)	-0.375**	-0.352***	-0.457***	-0.407***	-0.456***	-0.413***						
	(0.162)	(0.128)	(0.159)	(0.129)	(0.157)	(0.129)						
Oil reserve $\times \Delta^{-}$ln(Nominal Oil Price)	0.389	-0.595	0.450	-0.556	0.449	-0.664						
	(0.877)	(1.105)	(0.814)	(0.932)	(0.812)	(0.899)						
Oil reserve $\times \Delta$ln(Nominal Oil Price)							-0.300*	-0.379**	-0.367**	-0.423**	-0.366**	-0.440***
							(0.154)	(0.181)	(0.147)	(0.168)	(0.147)	(0.162)
Democracy			0.019***	0.022***	0.019***	0.021***			0.018***	0.022***	0.019***	0.021***
			(0.004)	(0.005)	(0.004)	(0.005)			(0.004)	(0.005)	(0.004)	(0.005)
GDP per capita (Log)					0.006	-0.277**					0.007	-0.276**
					(0.075)	(0.108)					(0.075)	(0.108)
Country specific trends	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	713	713	713	713	713	713	713	713	713	713	713	713
Countries	111	111	111	111	111	111	111	111	111	111	111	111

Notes : Δ^{+}ln(Nominal Oil Price) and Δ^{-}ln(Nominal Oil Price) are respectively the positive change and the negative change in the natural log of nominal oil prices. All specifications include year dummies and country fixed effects. Clustered Standard errors at country level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Now I explore the possibility that the estimates may capture the arrival to power of national leaders with low education attainment by irregular means such as military coups. For instance, Carreri and Dube (2017) show that positive oil shocks can lead to the use of extra legal forces to take power in Colombian municipalities. This analysis is also important because military are preponderant in the sample. In order to test for this potential phenomenon, in Table 3.5 , I estimate in columns (1)-(6) the effect of oil price shocks on the probability of selecting a military and in columns (7)-(12) I exclude coup leaders from the sample.[28] The idea for columns (1)-(6) estimates is that if this phenomenon is important in the sample, these estimates should show that military tend to be more selected following oil shocks. However, the results indicate otherwise. All the estimates show a negative and statistically significant effect meaning that oil price shocks do not encourage military to cease power. In addition, excluding coup leaders from the sample do not change the baseline results. For instance, in column (12) the effect of oil price shocks is the same as the one from column (6) in Table 3.1. In the Appendix, I also provide estimates focusing on the sub-sample of leaders that comes to power according to the existing institutions governing political transitions and on elected national leaders (see Table 3.14). The results are robust to these restrictions and are consistent with Cotet and Tsui (2013) who show that oil wealth is not correlated to military coups and irregular political transitions.

[28]Note that for the estimates excluding coup leaders in columns (7)-(12), I lose 93 leaders relative to our baseline estimates. These leaders are from 51 countries in the sample. Among these 51 countries, only two are completely missing from the sample (Omar with one leader and Qatar with 2 leaders).

Table 3.5
Power struggle and the selection of a national leader of Graduate level of education

Dependent variable :	Military leader						Graduate level (excluding coup leaders)					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Oil reserve × Δln(Oil Price)	-0.362***	-0.305**	-0.229**	-0.241**	-0.244**	-0.243**	-0.313**	-0.399**	-0.360**	-0.439***	-0.366**	-0.498***
	(0.137)	(0.149)	(0.112)	(0.123)	(0.110)	(0.118)	(0.140)	(0.163)	(0.148)	(0.149)	(0.145)	(0.156)
Democracy			-0.036***	-0.041***	-0.037***	-0.041***			0.015***	0.022***	0.015***	0.021***
			(0.005)	(0.006)	(0.005)	(0.006)			(0.005)	(0.007)	(0.006)	(0.007)
GDP per capita (Log)					-0.077	-0.018					-0.029	-0.297**
					(0.062)	(0.138)					(0.092)	(0.128)
Country specific trends	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	706	706	706	706	706	706	620	620	620	620	620	620
Countries	111	111	111	111	111	111	109	109	109	109	109	109

Notes : In Columns (1)-(6), the dependent variable is a dummy =1 if the selected national leader is a former Military professional and 0 otherwise. Columns (7)-(12) provide results for the sub-sample excluding coup leaders. All specifications include year dummies and country fixed effects. Clustered Standard errors at country level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

In Table 3.6 below, I explore the possibility of an omitted variable bias. As natural resource wealth may reduce the incentives to invest in education (Gyfalson, 2001) it is important to control for the educational attainment in the country in order to be sure that the estimates presented so far do not suffer from a bias due to its omission. Again, country-specific trends should pick up the effect of education but I take the precaution to control for the average level of education of the population over 25 years old in columns (1)-(6). Besides, I also control for the professional background of the national leader in columns (7)-(12) as some professions may require more years of education. The results are similar to the baseline estimates. The educational attainment in the population does not have a statistically significant effect on the probability of selecting a national leader with a graduate level of education. Also, lawyers are 18% more likely to have a graduate level of education (column 8) while military are 30% less likely to have a graduate level of education (column 10). Table 3.15 in the appendix, shows similar results controlling for the average year of education of the population over 15 years old.

Table 3.6
Country education, leaders' profession and the selection of a national leader

Dependent variable : Graduate level of education	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Oil reserve × Δln(Oil Price)	-0.407**	-0.390***	-0.406**	-0.387***	-0.408**	-0.421***	-0.408***	-0.469***	-0.492***	-0.571***	-0.421***	-0.499***
	(0.165)	(0.150)	(0.167)	(0.150)	(0.169)	(0.137)	(0.151)	(0.157)	(0.152)	(0.164)	(0.152)	(0.158)
Average year of education(over 25)	0.028	0.046	0.017	0.005	0.012	0.007						
	(0.038)	(0.090)	(0.037)	(0.096)	(0.038)	(0.094)						
Democracy			0.021***	0.021***	0.021***	0.021***	0.016***	0.019***	0.007**	0.009**	0.018***	0.022***
			(0.005)	(0.007)	(0.006)	(0.006)	(0.004)	(0.005)	(0.003)	(0.004)	(0.004)	(0.005)
GDP per capita (Log)					0.034	-0.270	-0.005	-0.288***	-0.041	-0.287***	-0.018	-0.280**
					(0.089)	(0.168)	(0.078)	(0.100)	(0.073)	(0.101)	(0.076)	(0.110)
Lawyers							0.147**	0.181***				
							(0.058)	(0.063)				
military									-0.305***	-0.302***		
									(0.047)	(0.048)		
Professors and Scientists											0.029	0.018
											(0.053)	(0.064)
Country specific trends	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	497	497	497	497	497	497	706	706	706	706	706	706
Countries	92	92	92	92	92	92	111	111	111	111	111	111

Notes : Average year of education (over 25) is the average year of education of the population over 25 years old. All specifications include year dummies and country fixed effects. Clustered Standard errors at country level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The empirical strategy so far includes the non-oil countries in order to capture a differential effect between oil countries and non-oil countries. Table 3.7 below focuses on the sample of oil countries only. The (marginal) effect of oil price shocks is stronger than in the baseline strategy including non-oil countries. For instance, in column (6), the results show that for the average oil country in the sample the change in oil prices over the period reduces the probability of selecting a national leader with a graduate level of education by 19.26%. This effect is larger than in the previous estimates employing oil reserves and including non-oil countries. Such a result is interesting and suggests that the main empirical strategy yields more conservative estimates.

Table 3.7
Focusing on the subsample of Oil Countries

Dependent variable : Graduate level of education	(1)	(2)	(3)	(4)	(5)	(6)
Oil reserve $\times$ Δln(Oil Price)	-0.557***	-0.651***	-0.660***	-0.687***	-0.681***	-0.706***
	(0.211)	(0.228)	(0.202)	(0.215)	(0.197)	(0.217)
Democracy			0.022***	0.023***	0.022***	0.023***
			(0.005)	(0.007)	(0.005)	(0.006)
GDP per capita (Log)					-0.084	-0.161
					(0.080)	(0.150)
Country specific trends	No	Yes	No	Yes	No	Yes
Observations	407	407	407	407	407	407
Countries	54	54	54	54	54	54

Notes : All specifications include year dummies and country fixed effects. Clustered Standard errors at country level in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

3.4.3 Heterogeneities

This section presents the exploration of potential heterogeneities in the sample that may help understand countries characteristics that are determinant for the leadership curse. I present three different analyses exploiting the difference in constitutional arrangements, different income groups and the difference in the level of ethnic

fragmentation. I investigate the role of the constitution and voting rules because Andersen and Aslasken (2008) show that constitutional arrangements matter for the "resource curse". Regarding the income groups, developing countries are usually characterized by a weak institutional environment and the quality of institutions is a key determinant of the resource curse (Mehlum, Moene, and Torvik, 2006). Finally, I will explore the relevance of high ethnic fragmentation because ethnic divides are central to the political economy of many countries. Also, higher levels of ethnic fragmentation have been shown to influence economic performance through public policies by impeding agreement about the provision of public goods. High ethnic fragmentation can also create rents for the groups in power at the expense of the society at large.[29]

First, I turn to the investigation of the empirical relevance of the constitutional arrangements and the electoral rules governing the political game. Empirical studies (Gerring and Thacker, 2004 ; Kucinová and Rose-Ackerman, 2005) show that constitution and electoral rules matter for political corruption. Gerring and Thacker (2004) find that parliamentary regimes exhibit lower political corruption as compared to presidential regimes. They explain this result by the fact that presidential regimes are characterized by too many veto points and an important political fragmentation where decision-making are diffused among a wide array of semi-independent actors.[30]

[29]See for instance Easterly and Levine (1997) and Alesina, Devleeschauwer, Easterly, Kurlat and Wacziarg (2003).

[30]Persson and Tabellini (2000) argue for the opposite in term of rent-seeking in a presidential(-congressional) regime but for the same reason (the separation of power). They argue rather that the separation of power may reduce political collusion.

On the other hand, Kucinová and Rose-Ackerman (2005) show that proportional representation systems are more characterized by corrupt political rent-seeking than plurality systems and this effect is particularly pronounced in presidential regimes.[31] Kucinová and Rose-Ackerman (2005) argue that proportional systems are not only characterized by a difficulty to monitor the actions of the leaders (both for voters and opposition parties) but also the leader can more effectively take the lion's share of corrupt opportunities.[32]

The empirical findings by Gerring and Thacker (2004) and Kucinová and Rose-Ackerman (2005) are consistent with Andersen and Aslasken (2008). The latter find that countries with presidential regimes suffer from the "resource curse" while countries with parliamentary regimes do not. They also find that countries with proportional electoral voting rules are more prone to the "resource curse". If the increase in the extractable rents from office is an important dimension of the mechanism of the leadership curse, then the effect of the latter should be more pronounced in presidential systems and in countries with a proportional representation because the access to rents is easy and leaders cannot be effectively monitored (Gerring and Thacker, 2004 ; Kucinová and Rose-Ackerman, 2005).

I estimate the baseline equation in the sub-sample of countries under a presidential and parliamentary regimes on one hand and in the sub-sample of countries that are characterized by a proportional voting rule.[33] I focus on the selections that take place under a given constitutional arrangement or voting rule. Table 3.8 shows the results

[31]Proportional representation is an electoral system where the divisions in an electorate are reflected proportionally in the elected body. For instance if 20% of the electorate body supports a particular political party, then 20% of seats will be won by that party. In this case, all the votes contribute to the result as opposed to the plurality system or the majoritarian rule where it is the majority of the electorate that appoints the representatives.

[32]This finding on proportional representation is consistent with Persson and Tabellini (2003).

[33]The data on regimes and proportional representation come from the Database of Political Institutions (DPI), Keefer (2010). The data are available from 1975. In order to preserve the size of the sample an thus to avoid loosing too many observations, I recode the different variables of presidential and parliamentary as dummies which take the value of 1 when a given institutional arrangement is in place and compute an average over the period for each country. If a country has been at least

for the exploration of the effect of oil price shocks on the probability of selecting an educated national leader for different types of regimes and electoral rules. The estimates show the results on the sub-samples of country-years under a presidential regime (columns (1)-(2)), a parliamentary regime (columns (3)-(4)) and a proportional voting rule (columns (5)-(6)).

Table 3.8
Constitution, electoral rule and the leadership curse

Dependent variable : Graduate level of education	Pdent		Parl		Prop	
	(1)	(2)	(3)	(4)	(5)	(6)
Oil reserve $\times$ Δln(Oil Price)	-0.440*	-0.964**	-0.706	-1.954	-0.916*	-1.417***
	(0.266)	(0.407)	(2.226)	(2.772)	(0.519)	(0.489)
Democracy	0.027***	0.038***	0.020*	0.030**	0.024*	0.062**
	(0.008)	(0.010)	(0.012)	(0.015)	(0.013)	(0.026)
GDP per capita (Log)	0.119	-0.203	-0.024	-0.364	0.009	2.122***
	(0.132)	(0.385)	(0.173)	(0.428)	(0.240)	(0.797)
Country specific trends	No	Yes	No	Yes	No	Yes
Observations	210	210	204	204	166	166
Countries	71	71	24	24	49	49

Notes : Columns (1)-(2), (3)-(4) and (5)-(6) show respectively estimates for the subsample of countries under a presidential regime, a parliamentary regime and a proportional voting rule. Pdent = Presidential, Parl=Parliamentary and Prop=Proportional voting rule. All specifications include year dummies and country fixed effects. Clustered Standard errors at country level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The estimates in Table 3.8 show that the leadership curse is more pronounced in presidential regimes and in countries with proportional representation while oil price shocks do not have a statistically significant effect in parliamentary regimes. More precisely, the estimates in column (2) imply that under presidential regimes, for the average oil-rich country, the change in oil prices over the period reduces the probability of selecting a national leader with a graduate level of education by 26.30%

50% of period 1975-2004 under a given institutional arrangement, I code it as having such characteristic. For instance, countries that have been under a presidential regime for at least 50% of the time period are classified as presidential regimes (see Table 3.26).

as compared to a non-oil country. Column (6) shows that in countries with proportional representation, the probability of selecting a national leader with a graduate level of education is 38.66% lower as compared to a non-oil country. These effects are significantly larger than in the baseline effect of 13.60% reduction in the probability. As mentioned earlier, these results show that the extractable rents from office are important for the underlying mechanism of the leadership curse because the effect is more pronounced in institutional environments that may be characterized by rent-seeking. These results are consistent with Andersen and Aslasken (2008) and Mehlum *et al.*(2006).

Secondly, let explore the effect of oil price shocks in the subsample of developing as opposed to developed (high income) countries. Developing countries dominate the sample (92 countries).[34] Table 3.9 shows the results for the two subsamples of developing and high income countries. It is evidently clear that the results are driven by developing countries as the effect of oil price shocks is not statistically significant in the subsample of high income countries.[35] In column (6), the results show that for the average oil-rich country in the sample, the oil price shocks over the period reduce the probability of selecting a national leader by 10.64% as compared to non-oil countries. The fact that these results are only present in the sample of developing countries may be explained by the institutional weakness that generally characterize them and this is not surprising.

[34]Countries are considered as developing countries if they have a Gross National Income (GNI) per capita less than 12,736 USD in the year 2004 or in the year 2000s if the data in 2004 were not available. This classification follows the World bank classification of high income countries as countries with a GNI per capita at least of 12,736 USD.

[35]Note that there is only 19 high income countries in the sample and this can explain the result. However the number of national leaders considered in these estimations (168) is reasonably sizable.

Table 3.9
Developing countries versus High income countries

Dependent variable : Graduate level of education	Developing countries						High income countries					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Oil reserve × Δln(Oil Price)	-0.259*	-0.333**	-0.321**	-0.350**	-0.307**	-0.390***	-1.887	-0.412	-1.791	-0.228	-1.644	-0.194
	(0.137)	(0.156)	(0.133)	(0.145)	(0.138)	(0.132)	(1.561)	(1.889)	(1.629)	(2.071)	(1.562)	(2.179)
Democracy			0.020***	0.021***	0.021***	0.021***			0.007	0.030*	0.008	0.030*
			(0.005)	(0.005)	(0.004)	(0.005)			(0.011)	(0.018)	(0.010)	(0.017)
GDP per capita (Log)					0.136**	-0.365***					-0.075	0.085
					(0.062)	(0.116)					(0.150)	(0.457)
Country specific trends	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	545	545	545	545	545	545	168	168	168	168	168	168
Countries	92	92	92	92	92	92	19	19	19	19	19	19

Notes : All specifications include year dummies and country fixed effects. Clustered Standard errors at country level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Now that the results show that the leadership curse seems to be a phenomenon that is present in developing countries only, it is interesting to test whether even among developing countries the effect of oil price shocks on the quality of selected national leader is heterogeneous. To this end, I separate the developing countries into two groups : a group of countries characterized by a high ethnic fragmentation and a group of countries with low ethnic fragmentation.[36]

The index of ethnic fragmentation measures the probability that two randomly selected individuals do not belong to the same ethnic group. I define a country as highly fragmented if the probability that two randomly selected individuals do not belong to the same ethnic group is at least of 50%. Otherwise, a country is included in the group of low ethnic fragmentation. Table 3.10 shows that the results are driven by ethnically fragmented developing countries. Indeed, the leadership curse appears only in the sub-sample of developing countries characterized by a high ethnic fragmentation. In addition, in some estimations, in the sample of low ethnic fragmentation positive oil price shocks have a positive effect on the probability of selecting a national leader with a graduate level of education (Columns 9 and 11). But these effects are not statistically significant in estimations including the country-specific (linear) trends. It is prudent therefore to consider that the results for this sub-sample are not statistically significant. In column (6), the estimates suggest that for the average oil-rich country in the sample, the change in oil prices over the period reduce the probability of selecting a national leader with a graduate level of education by 18.28% relatively to non oil countries. Table 3.10 implies evidently that the previous results on developing countries (Table 3.9) is entirely due to ethnically fragmented ones. Overall, the results indicate that the leadership curse might stem from developing countries endowed with oil and that are characterized by a high ethnic fragmentation.

[36]The data on ethnic fragmentation are taken from Montalvo and Reynal-Querol (2005).

Table 3.10
Developing countries : High ethnic fragmentation versus low ethnic fragmentation

Dependent variable : Graduate level of education	High ethnic fragmentation						Low ethnic fragmentation					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Oil reserve × Δln(Oil Price)	-0.574***	-0.647***	-0.744***	-0.689***	-0.731***	-0.670***	0.266	0.263	0.422**	0.590	0.441**	0.156
	(0.174)	(0.210)	(0.126)	(0.189)	(0.134)	(0.172)	(0.209)	(0.407)	(0.207)	(0.368)	(0.216)	(0.392)
Democracy			0.031***	0.028***	0.031***	0.027***			0.017**	0.029***	0.017**	0.027***
			(0.006)	(0.006)	(0.006)	(0.006)			(0.008)	(0.009)	(0.008)	(0.009)
GDP per capita (Log)					0.125	-0.161					0.027	-0.402*
					(0.098)	(0.182)					(0.122)	(0.233)
Country specific trends	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	230	230	230	230	230	230	262	262	262	262	262	262
Countries	39	39	39	39	39	39	35	35	35	35	35	35

Notes : A country is considered to be characterized by a high ethnic fragmentation if the index of ethnic fragmentation is at least of 0.5 and considered as characterized by a low ethnic fragmentation otherwise (the data are taken from Montalvo and Reynal-Querol, 2005). All specifications include year dummies and country fixed effects. Clustered Standard errors at country level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

3.5 Further investigation : Are other natural resources also relevant for the leadership curse?

In this section, I investigate whether the leadership curse can be extended to other natural resources. I take data on mineral rent as share of GDP from the WDI as a proxy for mineral resource abundance.[37] The data are available starting in 1960 and this implies a reduction in the sample size.

I construct a country-specific mineral resource price index following Deaton (1999), Brückner and Ciccone (2010) and Eklou (2015) in computing the country-specific price index as :

$$\text{Mineral Price index}_{it} = \sum_{r=1}^{8} \varpi_{ir} \times \text{Price}_{rt} \tag{3.2}$$

Where ϖ_{ir} is the country i's time invariant export share of resource r and Price_{rt} is the international price of resource r in year t.[38] Because the country-specific international price index uses a time invariant weight, it allows the measurement of price growth to be plausibly exogenous. The time invariant weights are not endogenous to policy change that may take place in response to the change in prices (Deaton, 1999). In order to compute the index, the starting point is the raw data on yearly nominal international prices from the World Bank. All the prices are set equal to unity in 2000 in order to obtain a price index with 2000 as the base year. I construct the country-specific mineral resource price index as a weighted average as shown in equation (3.2).

[37] Minerals included are : bauxite, copper, gold, iron, lead, nickel, phosphate, silver, tin and zinc.

[38] I obtain each country's export share of the resources from United Nations Conference on Trade and Development (UNCTAD) for the year 2000. The data were available from 1995 to 2013. The export share of a given resource is the ratio of this resource's export over the total export of the country in the year 2000. The data on the international price of bauxite and the data on phosphate exports were not available. It is the reason for summing only up to 8 instead of 10.

I take a similar approach to the empirical strategy previously employed : investigating whether mineral wealth induced by changes in prices affect the probability of selecting an educated national leader. However the set-up is slightly different. I use the average share of mineral rents in GDP over the period 1960-2004. In addition, as the price index is country-specific, it is also included among control variables. Also, there are only 23 countries with no (zero) mineral rents over the period.[39]

Table 3.11
Leadership curse - Mineral wealth

Dependent variable : Graduate level of education	(1)	(2)	(3)	(4)	(5)	(6)
Mineral rents (% GDP) × Δln(Mineral Price Index)	-0.048	-0.847***	-0.151	-0.817***	-0.212	-0.784***
	(0.434)	(0.304)	(0.411)	(0.286)	(0.391)	(0.288)
Δln(Mineral Price Index)	-0.862	2.430	0.628	3.369*	0.827	3.347*
	(2.342)	(2.156)	(2.430)	(1.995)	(2.316)	(1.994)
Democracy			0.023***	0.024***	0.023***	0.024***
			(0.005)	(0.006)	(0.005)	(0.006)
GDP per capita (Log)					0.077	-0.300*
					(0.083)	(0.175)
Country specific trends	No	Yes	No	Yes	No	Yes
Observations	512	512	512	512	512	512
Countries	110	110	110	110	110	110

Notes : All specifications include year dummies and country fixed effects. Minerals included are bauxite, copper, gold, iron, lead, nickel, phosphate, silver, tin and zinc. Clustered Standard errors at country level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3.11 shows the results. First of all note that we lose some observations because this investigation is over the period 1960-2004.[40] The results show a negative effect of mineral price shock (the interaction term) only for specifications including country-specific (linear) trends. The point estimates are larger than in the baseline

[39]These countries are : Angola, Bahrain, Comoros, Cape Verde, Chad, Djibouti, Estonia, Gambia, Guinea-Bissau, Haiti, Iraq, Kuwait, Lebanon, Libya, Lesotho, Malawi, Mauritus, Moldova, Paraguay, Qatar, Singapore, Trinidad and Tobago, and United Arab Emirates.

[40]I lose also one country for which there were not available data on mineral rents (Somalia). Table 3.27 in Appendix shows that the leadership curse (based on oil price shocks) still hold and allows us to have a benchmark.

but in order to compare them one should take into account the magnitude of the shocks. For instance, in column (6), the point estimate implies the following. For the average country with a mineral of 0.8% of GDP, the changes in mineral prices over the period reduce the probability of selecting a national leader with a graduate level of education by 8.15%.[41] The changes in oil prices over the same period are associated with a reduction in the probability by 13.22%.

The finding shows that the leadership curse is stronger and more robust with oil compared to other minerals. In Table 3.12 , we include both price shocks : oil price shocks and mineral resource price shocks. The results remain similar. Overall, Table 3.11 and Table 3.12 show results that are consistent with the predominant place of oil in the literature on the "resource curse" (Ross, 2001 ; Sala-i-Martin and Subramanian, 2003 ; Tsui, 2011 and, Lei and Michael, 2014).

[41]Table 3.28 in Appendix focusing on the sub-sample of countries with positive rents shows similar results. I also investigated the heterogeneities and I find that the leadership curse based on mineral rents is present both in developing and advanced countries. In addition, the ethnic fragmentation does not seem to matter in this case. These results are not included but available upon request.

Table 3.12
Leadership curse - A horse race between Mineral and Oil wealths

Dependent variable : Graduate level of education	(1)	(2)	(3)	(4)	(5)	(6)
Oil reserve $\times$ Δln(Oil Price)	-0.471***	-0.412***	-0.490***	-0.416***	-0.487***	-0.471***
	(0.159)	(0.132)	(0.162)	(0.128)	(0.167)	(0.125)
Mineral rents (% GDP) $\times$ Δln(Mineral Price Index)	-0.040	-0.846***	-0.143	-0.816***	-0.203	-0.778***
	(0.440)	(0.304)	(0.417)	(0.287)	(0.398)	(0.290)
Δln(Mineral Price Index)	-0.952	2.328	0.543	3.267*	0.738	3.229
	(2.344)	(2.144)	(2.433)	(1.980)	(2.318)	(1.979)
Democracy			0.023***	0.024***	0.023***	0.024***
			(0.005)	(0.006)	(0.005)	(0.006)
GDP per capita (Log)					0.075	-0.341*
					(0.084)	(0.176)
Country specific trends	No	Yes	No	Yes	No	Yes
Observations	512	512	512	512	512	512
Countries	110	110	110	110	110	110

Notes : All specifications include year dummies and country fixed effects. Minerals included are bauxite, copper, gold, iron, lead, nickel, phosphate, silver, tin and zinc. Clustered Standard errors at country level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

3.6 Theoretical Framework

In this section, I develop a theoretical framework inspired by Dal Bó *et al.* (2006) in order to provide an explanation for the leadership curse based on the role of ethnic fragmentation and patronage (or lobbying). The main feature of this model is to emphasize the role of a positive oil price shock (and its interaction with ethnic fragmentation) in explaining the composition of the pool of candidates and therefore the level of education of selected leaders. The composition of the pool of candidates is important because as stated by Key (1956) "if the people can choose only from among rascals [low quality politicians or politicians with a low level of education], they are certain to choose a rascal".

I introduce the role of oil wealth and ethnic fragmentation in the framework by Dal Bó *et al.* (2006). An intuitive path is to understand how a positive oil price shock may affect the rewards to holding office (relative to the opportunity cost, e.g. wages in the private sector). The intuition is that it may affect differently the incentives of highly educated citizens and the ones with a low level of education to run for pubic office. Many studies stress how the rewards from office can shape the quality of candidates and their performance once in office (Besley, 2004; Kotakorpi and Poutvaara, 2011; Gagliarducci and Nannicini, 2013).[42] For instance, Kotakorpi and Poutvaara (2011) find that a higher salary increases the fraction of candidates with higher education among females candidates.

[42] In the theoretical literature, the effect of an increase of salary on the quality of candidates is ambiguous. Besley (2004) argues that it is possible that this increase in salary results in a worse pool of candidates as monetary incentives may attract low quality candidates (crowding out high quality candidates who are characterized by a public service motivation). Poutvaara and Takalo (2007) show in their theoretical framework that increasing pay to politicians does not necessarily improve the quality of the pool when campaign is costly.

On the other hand, Gagliarducci and Nannicini (2013) find that in Italian municipalities higher wages attract more educated candidates. Furthermore, they find that better-paid politicians make the government machinery more efficient (by reducing the size of the government and by increasing the speed of revenue collection). More importantly they find that this effect is solely driven by the selection of competent politicians.

3.6.1 Set-up

Consider a developing country populated by citizens that are individually characterized by an observable ability parameter α, with $\alpha \in [0, \infty[$. As education signals the ability (or competence) of an individual (Besley and Reynal-Querol, 2011 and, Yu and Jong-A-Pin, 2016), it is an example of an observable ability. The ability is distributed according to a function $\Phi(\alpha)$ with an associated density function $\phi(\alpha)$. In addition, the country has a stock of r barrels of oil. Thus, again, as oil wealth (R) in any point in time is directly proportional to the stock of oil reserves (Miller and Upton, 1985), $R = \Delta p \times r$, where Δp is the change in the \$ price per barrel of oil.

The population is composed by a large number (N) of ethnic groups. Each citizen in this developing country is assumed to be loyal to her own ethnic group. One way that this loyalty can be seen is through citizens' trust and obedience to their ethnic leaders. It follows that, ethnic chiefs can influence the choices made by citizens including how they cast their votes. Let λ be a parameter capturing the strength of ethnic loyalty in the country. The higher is λ, the stronger is the ethnic loyalty in the country and the stronger is the influence of ethnic chiefs. During election years, chiefs of ethnic groups can constitute a coalition and offer a lobbying (or patronage) deal to candidates in order to get them elected. I will describe in more detail the nature of this deal.

The economy is composed by two sectors : the public sector and the private sector. In the public sector, the wage (ω) is fixed while in the private sector individuals are paid according to their ability (α). Indeed, wages of politicians do not usually depend on their level of education or their human capital. In this framework, this assumption on wages implies that the ability ("quality") of leaders is directly determined by the payoff that they will get in office.

3.6.2 Timing of events

This is a two-stage model as follows. In the first stage, citizens with different level of abilities (education) make their choices about whether to enter the pool of candidates or to stay in the private sector. In the second stage, there are three sub-stages. In the the first sub-stage, the coalition of ethnic chiefs observe the economy regarding the level of resource wealth (R) and decide to offer a deal to candidates.[43] This deal consists in offering an electoral support (v) in exchange for favors in the form of a share of rents (ξ) once the candidate is in office. Rents from office are therefore extractable.

In addition, in order to make the deal credible so that once in office the previously candidate honors it, the coalition of ethnic chiefs has the capacity to formulate coup or revolution threats. In sum, the deal has three components : a vote support, an amount of rent in exchange for this support and a threat (in case the leader does not obey). An interesting example of ξ, is the allocation of ministerial posts to ethnic groups in the government. For instance, Francois *et al.* (2015) show that in Africa since independence (in 1960s), the cabinet composition is allocated proportionally to the share of ethnic groups in the population.

[43]Note that as the candidate is from a given ethnic group, the coalition of ethnic chiefs are from the remaining $N-1$ ethnic groups. The implicit assumption is therefore that any candidate will need the support of the other ethnic groups to win an election.

In the second sub-stage, the selection takes place while in the third and last sub-stage, the newly selected leader decides to respect the engagement with a probability θ.

First stage : Decision of entering the pool of candidates

Let W be the expected return from office. Citizens with an ability level such that $\alpha \leq W$ will enter the pool of candidates. It implies that the expected return from public office determines the quality (ability or education) of the pool of candidates. As I will explain in the next section, the earning in public office also depends on the behavior of the coalition of ethnic chiefs. If the coalition did not exist or were not powerful to exert an influence, all citizens with an ability level such that $\alpha \leq \omega$ will enter the pool of candidates. In sum, individuals decide to run for office if the expected return from public office is higher than the opportunity cost i.e, the wage in the private sector α. It is assumed that if an individual is indifferent between entering the pool and staying in the private sector, she will run for office.

Second stage : Interaction with the coalition of ethnic chiefs

As mentioned earlier, the coalition has two instruments to influence the leader in return for an allocation of rents (ξ). The first instrument is providing an electoral support (v). The second instrument is a coup or a revolution threat (t). This second instrument is a complement to the first one because the electoral support takes place before the leader takes power. The threat of political instability ensures therefore that once in office the leader respects the deal. The intuition is similar to Francois *et al.* (2015) who show that the threat of revolution and coups is the driving force behind the allocation of ministerial post among ethnic groups in African governments.

As these two instruments are complementary, when the coalition is active, it also has the bargaining power. It costs $\delta S(v,\lambda) = \delta \times \frac{v}{\lambda}$ to deliver the electoral support and $\tau T(t,R) = \tau \times \frac{t}{R}$ to stage a coup or initiate a revolution.[44]

As λ captures the degree of ethnic loyalty, I model the cost of delivering a political support as a decreasing function of this parameter. The stronger is the ethnic loyalty in the country, the lower is the cost for the ethnic chiefs to influence their co-ethnics. In other words, the stronger the ethnic loyalty, the easier it is for the coalition to gather an electoral support. In addition, a large oil wealth (R) through a positive oil price shock, reduces the cost of staging a coup or initiating a revolution.[45] The intuition is that a large oil wealth will increase the incentive of the coalition to challenge the leader.[46] The large oil wealth may also generate a strong demand for redistribution, the so-called "voracity effect" (Tornell and Lane, 1999), which if not satisfied may lead to a revolution. Indeed, the larger the oil wealth, the larger is the size of the pie to be shared among different ethnic groups. For these reasons, a positive oil price shock makes the revolution or coup threat credible.

[44] I use these simple functions $S(\cdot)$ and $T(\cdot)$ in order to make the model tractable without any loss of generality. The parameters $\delta > 0$ and $\tau > 0$ capture institutional and technological constraints that affect respectively the cost of delivering electoral (or political) support and staging a coup.

[45] It is straightforward to see that given the modeling, if $\lambda \to \infty$, the cost of providing a political support converges to 0. In the same way, if there is no ethnic loyalty ($\lambda \to 0$) the cost of providing the electoral support explodes ($S(v,\lambda) \to \infty$). The same intuition holds for the cost of staging a coup, regarding R.

[46] See for instance Caselli and Cunningham (2009).

3.6.3 Preferences

The leader cares about the reward from office composed by wages (ω) and being in power (ν), the coup or the revolution threat (t) and the moral or reputational cost for being involved in such a deal (μ).[47]

The future leader will accept the proposition of the coalition of ethnic leaders if :

$$\omega + \nu - \mu \geq \omega - t \tag{3.3}$$

It is assumed within the framework that with a probability $(1-\theta)$ it is impossible for the leader to respect the deal and the coalition initiates the coup or the revolution, in which case the payoff of the leader is $\omega - t$. Inequality (3.3) is equivalent to $\nu \geq \mu - t$. This condition has a particular meaning. It means that a citizen candidate accepts the offer if only the value of being in power is larger or equal to the moral cost of being part of the deal and the cost associated to the possibility of a coup or a revolution. In other words, citizens who particularly value power are more likely to take such an offer. This situation is close to the one described by Collier (2007). He argues that the cost effectiveness of patronage in resource-rich countries with a strong ethnic loyalty makes electoral competition malfunctions as it will attract "crooks rather than altruist" into politics. However, this does not say anything about the ability (or the level of education) of politicians. In order to show the effect on the level of ability of political leaders, I will compare the scenario with an inactive coalition of ethnic chiefs to a scenario where the latter is active.

[47] One could also model this reputational cost as a function of the ability in order to reflect the fact that citizens with a high ability may suffer a more important reputational cost. This is because they could have difficulty finding a job in the private sector and this loss is important as the remuneration is equal to the level of ability (see for instance Brollo *et al.*, 2013). Modeling μ as a constant makes the model more tractable without any loss of generality.

The coalition on the other hand chooses to provide an electoral support (and political stability) and makes the threat of a coup such that it maximizes its expected payoff defined as :

$$\Gamma(\nu,t) = \theta[\xi - \delta S(\nu,\lambda)] + (1-\theta)\tau T(t,R) \tag{3.4}$$

$$\text{subject to : } \nu \geq \mu - t$$

Recall that ξ is the share of rent allocated to the coalition, $\delta S(\nu,\lambda)$ is the cost of electoral support and $\tau T(t,R)$ the cost of the coup or the revolution threat. For tractability, I assume that the coalition has the following set of choices $\nu \in \{0,1\}$ and $t \in \{0,1\}$. The value 1 means that the coalition makes a given choice while the value 0 means that it does not. For instance, $\nu = 1$ means that the coalition chooses to provide an electoral support to the candidate. As I will show in more details in the next section, there are only two plausible cases $\{\nu = 1 \text{ and } t = 1\}$ on one hand and, $\{\nu = 0 \text{ and } t = 0\}$ on the other hand. In brief, either the coalition is active by providing an electoral support and the threat or it is inactive.

3.6.4 Equilibrium and Result

I will start by presenting the benchmark case (with an inactive coalition) followed by the case of an active coalition.

The benchmark case : the coalition of ethnic chiefs is inactive

Lemma 1 : The level of ability in the pool of candidates is ω when there is no ethnic pressure

In the absence of the coalition of ethnic chiefs, all citizens with a level of ability such that $\alpha \leq \omega$ will enter the pool of candidates. Indeed, the quality of politicians is determined by the expected payoff from office. When the coalition is absent, the payoff from office is the fixed wage ω.

Result for an active coalition

Lemma 2 : a) The necessary condition for the coalition to be active is a positive oil price shock ($R > 0$) and a strong ethnic loyalty ($\lambda > 0$). b) The sufficient condition for the coalition to be active is that the expected benefit $\theta\xi$ is equal or larger than the total cost $\theta\delta S(v,\lambda) + (1-\theta)\tau T(t,R)$ i.e the value of ξ is not smaller than $\bar{\xi} \equiv \delta S(v,\lambda) + \frac{1-\theta}{\theta}\tau T(t,R) \equiv \delta\frac{1}{\lambda} + \frac{1-\theta}{\theta} \times \frac{1}{R}$.

From inequality (3.3) and Lemma 2 a), if the coalition is active, it always chooses $\{v = 1 \text{ and } t = 1\}$. Indeed, the only case where the coalition is active is when there is a positive oil price shock and a strong ethnic loyalty. Consider the case of no positive oil price shock and a strong ethnic loyalty ($R = 0$ and $\lambda > 0$). In this case, there is no incentive for the coalition to make a deal even if it is possible to provide the electoral support because the coup or revolution threat is not possible. The reason is that, without a credible threat, there is no guarantee that the leader once in office will respect the deal. In the case of a positive oil price shock and no ethnic loyalty ($R > 0$ and $\lambda = 0$), the coalition does not have the ability to provide an electoral support, the centerpiece of the deal.

The activity of the coalition has an implication for the level of ability of the pool of candidates and therefore the level of ability or education of the leader. In order to derive this implication, I will determine the equilibrium payoff of the leader. In the case of an active coalition of ethnic chiefs, the leader receives $\omega - t$ regardless of his actions. Indeed, if the leader refuses to respect the deal, this payoff is $\omega - t$. Even if he honors the deal, the payoff is $\omega - t$.

Proposition : During an electoral period with a large positive oil price shock in a country with a strong ethnic loyalty, the level of ability of a selected leader is lower than in a period without this shock.

During an electoral period without a positive oil price shock, the coalition is not active and the payoff from public office is ω (from Lemma 1). The quality of the pool in term of ability is ω as all citizens with a level of ability $\alpha \leq \omega$ will be candidates. However, in the case of an active coalition, that is a positive oil price shock and a strong ethnic loyalty, the payoff from public office is $\omega - 1$. The level of ability in the pool of candidates in the case of an active coalition is lower than in the case of an inactive coalition ($\omega - 1 < \omega$). The main mechanism is that the threat of revolution or of coups deter the candidacy of citizens with a high ability. The threat of revolution and coups is similar to a tax on the reward from office and therefore reduce the incentive of high ability citizens to run for office. These high ability citizens would rather stay in the private sector.

Many studies stress how the rewards from office can shape the quality of candidates and their performance once in office (Besley, 2004; Kotakorpi and Poutvaara, 2011; and Gagliarducci and Nannicini, 2013).[48] For instance, Kotakorpi and Poutvaara (2011) find that a higher salary increase the fraction of candidates with higher education among females candidates. On the other hand, Gagliarducci and Nannicini (2013) find that in Italian municipalities higher wages attract more educated candidates and better-paid politicians make the government machinery more efficient (by reducing the size of the government and by increasing the speed of revenue collection). More importantly, they find that this effect is driven by the selection of competent politicians.

This theoretical framework generates an implication that is consistent with the finding that the leadership curse is driven by ethnically fragmented developing countries. I provide an additional evidence of the link between the level of ability of leaders

[48]Theoretically the effect of an increase of salary on the quality of candidates is ambiguous. Besley (2004) argues that it is possible that this increase in salary results in a worse pool of candidates as monetary incentives may attract low quality candidates (crowding out high quality candidates who are characterized by a public service motivation). Poutvaara and Takalo (2007) show in their theoretical framework that increasing pay to politicians does not necessarily improve the quality of the pool when campaign is costly.

and oil wealth (proxied by oil reserves). I exploit data on the cognitive ability of leading politicians covering 40 countries from Rindermann, Sailer and Thompson (2009).[49] Using information on the level of education, Rindermann *et al.* (2009) provide IQ estimates of leading politicians over the period 1960-2009. The latter are defined as those who have the real decisive power (mostly presidents and heads of governments). In Figure 3.4 , focusing on the sample of developing countries, there is a negative correlation between the oil wealth and the cognitive ability of leading politicians.[50] In addition, this correlation is stronger in the sub-sample of developing countries with high ethnic fragmentation (-0.52) than in countries with low ethnic fragmentation (-0.39).

3.7 Conclusion

What are the channels through which natural resources may hamper economic growth? This paper adds to the political foundations of the "resource curse" by showing that natural resources affect the type of individuals that come to power. Analyzing the effect of natural resources on political selection is important because a large part of the literature on the political foundations of the "resource curse" focuses on how these resources affect the leader's behavior once in office. In addition, there is a strong empirical evidence that the type of politicians in power affects policy choices. This paper bridges this gap in the literature by making the point that precisely, natural resources may distort who comes to power and then decides which policy choices to make.

[49] Cognitive ability or intelligence is "the ability to reason, to solve problems, to understand complex ideas well, to learn quickly and to benefit from one's experiments".

[50] See Figure 3.8 in the Appendix that shows the correlation between oil wealth and the cognitive ability of 40 countries including high income countries. I exclude Saudi Arabia from the two figures as it is an outlier.

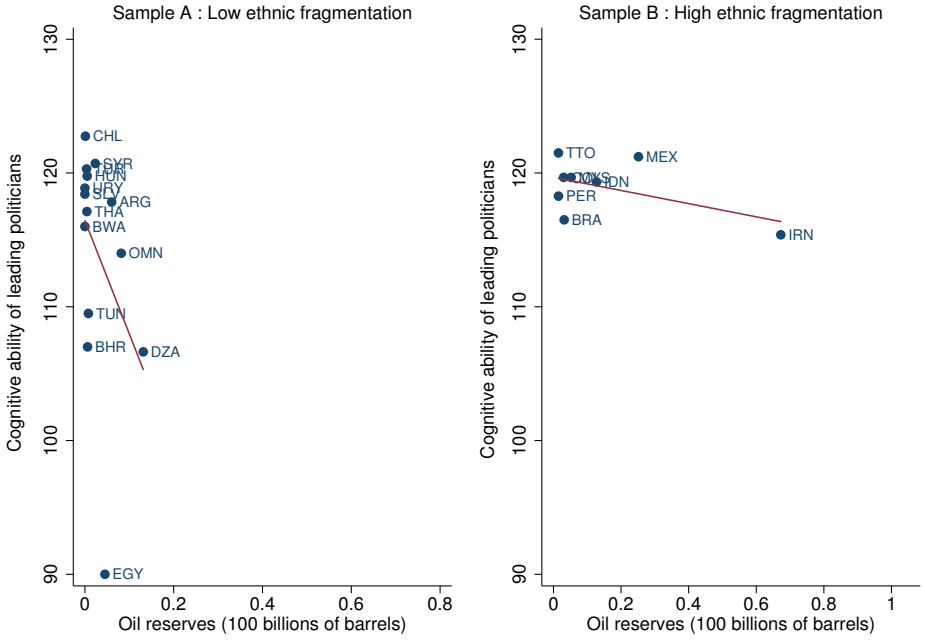
Using a cross-country panel dataset on more than 700 leaders from 111 countries over the period 1930-2004, I investigate whether a resource boom, specifically a positive oil price shock reduces the chances of selecting highly educated leaders. The empirical strategy exploits a difference-in-differences approach. I investigate whether positive oil price shocks have a disproportionate effect on the probability of selecting a national leader with a high level of education in oil-rich countries. The results show that the historical rise in oil prices observed over the period contributed to a reduction ranging between 11.80% and 20.79% in the probability of selecting a national leader with a graduate level of education for the average oil-rich country. Thus, the results suggest that positive oil price shocks may increase the occurrence of the "resource curse" by reducing the chances of having a competent national leader with the (expected) ability to make the best policy choices once in office.

I explored also potential heterogeneities in the sample in order to shed more light on the mechanisms of the leadership curse. I find that, this effect is particularly pronounced in presidential regimes and in countries under a proportional voting rule. The empirical investigation shows also that the results are driven by developing countries characterized by a high ethnic fragmentation. I propose a theoretical framework to shed light on this latter finding. The model features the interaction between a prospective national leader and a coalition of ethnic chiefs. The coalition offers an electoral support to a candidate in exchange for future favors once the latter takes office. Also, in order to guarantee that the new leader respects the deal, the coalition specifies a threat of coups or revolution. A positive oil price shock makes this threat (which is similar to a tax on the reward from office) credible. This situation therefore deter the candidacy of highly educated citizens who prefer to stay in the private sector. The feasibility of patronage in ethnically fragmented environments is therefore likely to induce a leadership quality trap : only low quality candidates have the incentives to run for office and this in turn may discourage the high quality citizens.

While there is a growing research on the determinants of political selection and the political foundations of the "resource curse", this paper is the first to the best of my knowledge to show that positive oil price shocks reduce the chances of selecting a competent national leader. However, it is clear that the present paper is only a first pass and much more needs to be done in order to understand the political foundations of the "resource curse". The results suggest that the political foundations of the resource curse are likely to have their root in the quality of selected leaders. Indeed I find also a similar result for mineral wealth (however less robust). This is particularly relevant because the volatility in resource-rich countries make it difficult for voters to discern between an incumbent's competence and luck. In other words, electoral control is well-known to be difficult in resource-rich countries. Moreover, it is also well-known that leaders tend to last in power in resource-rich countries and therefore the quality of political selection is crucial for economic development. In this regard, the literature in its current state focuses only on the effects of natural resources on the incentives of politicians once in office. But if the peoples that are selected for public office are not competent, it is likely that their performance in office would be poor.

Overall, the findings in this paper motivate the importance of having a theoretical framework that includes both the adverse selection and the moral hazard effects. In addition, in future works it would be interesting to disentangle empirically the selection from the incentive effects in a unified framework. Also, due to the lack of data, I could not test for instance the effects on the composition of the pool of candidates, or exploit besides the level of education of national leaders, their area of studies. The use of micro-economic level data (focusing on a country for instance) is a promising approach in order to investigate the leadership curse and provide more granular explanations in future works. The paper then suggests a future avenue for research related to how natural resources may influence the type of leader that takes power and thereby affect economic performance.

Figure 3.4
Correlation between the ability of leading politicians and oil wealth
in developing countries



Notes : The data on the cognitive ability of leading politicians come from Rindermann *et al.* (2009). They provide IQ estimates of leading politicians defined as those who have the real decisive power (mostly presidents and heads of governments) over the period 1960-2009. This cross-sectional data covers 90 countries that participate in student assessment studies. This figure shows the correlation in developing countries for which I have data on the cognitive ability of politicians and data on oil wealth. Sample A is the sub-sample of countries characterized by a low level of ethnic fragmentation (an index lower than 0.5). Sample B is the sub-sample of countries characterized by a high level of ethnic fragmentation (an index higher than 0.5). The correlation between oil wealth and the cognitive ability of leading politicians is -0.391 in Sample A, while it is -0.520 in Sample B.

3.8 Appendix Chapter 3

Countries in the sample[51]

Oil Countries

Albania	Colombia (2)	Libya	Trinidad &
Algeria (3)	Congo, Rep. (2)	Malaysia (2)	Tobago(2)
Angola (2)	Croatia	Mexico (2)	Tunisia (3)
Argentina (3)	Denmark (1)	Netherlands (1)	Turkey (3)
Australia (1)	Ecuador (2)	Nigeria (2)	Ukraine
Austria (1)	Egypt (3)	Norway (1)	United Arab
Azerbaijan	Gabon (2)	Oman (3)	Emirates (1)
Bahrain (3)	Germany (1)	Pakistan (2)	United Kingdom
Bolivia (2)	Hungary (3)	Peru (2)	(1)
Brazil (2)	India (2)	Qatar (1)	United States (1)
Cameroon (2)	Indonesia (2)	Russia	Venezuela (2)
Canada (1)	Iran (2)	Saudi Arabia (3)	Vietnam
Chad (2)	Iraq (3)	Sudan (2)	
Chile (3)	Italy (1)	Syria (3)	
China (2)	Kuwait (1)	Thailand (3)	

Non-Oil Countries

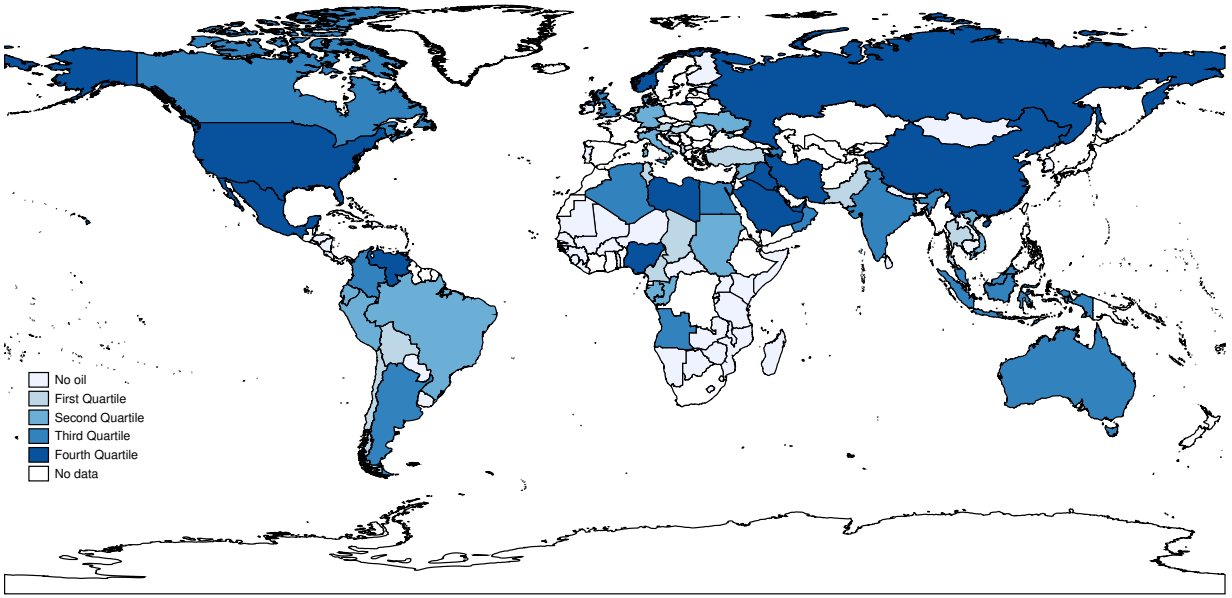
Armenia	Cape Verde (3)	Dominican R. (3)	Guinea-Bissau (2)
Belgium (1)	Central Afric	El Salvador (3)	Haiti (3)
Botswana (3)	Rep.(2)	Estonia	Honduras (3)
Burkina Faso	Comoros (3)	Finland (1)	Ireland (1)
Burundi (3)	Costa Rica (3)	Gambia, The (2)	Jamaica (3)
Cambodia	Djibouti	Guinea (2)	Kenya (2)

[51](1) = High income countries and the remaining are developing countries : (2) = highly fragmented, (3) = countries with low ethnic fragmentation.

Korea, Rep.(1)
Laos
Lebanon
Lesotho (3)
Liberia (2)
Macedonia
Madagascar (3)
Malawi (2)
Mali (2)
Mauritania (3)
Mauritius (3)
Moldova
Mongolia
Mozambique (2)
Namibia
Nepal (2)
Nicaragua (3)
Niger (2)
Panama (3)
Paraguay (3)
Portugal (1)
Rwanda (3)
Senegal (2)
Sierra Leone (2)
Singapore (1)
Somalia (3)
Sri Lanka (3)
Swaziland (3)
Tanzania (2)
Togo (2)
Uganda (2)
Uruguay (3)
Zambia (2)
Zimbabwe (2)

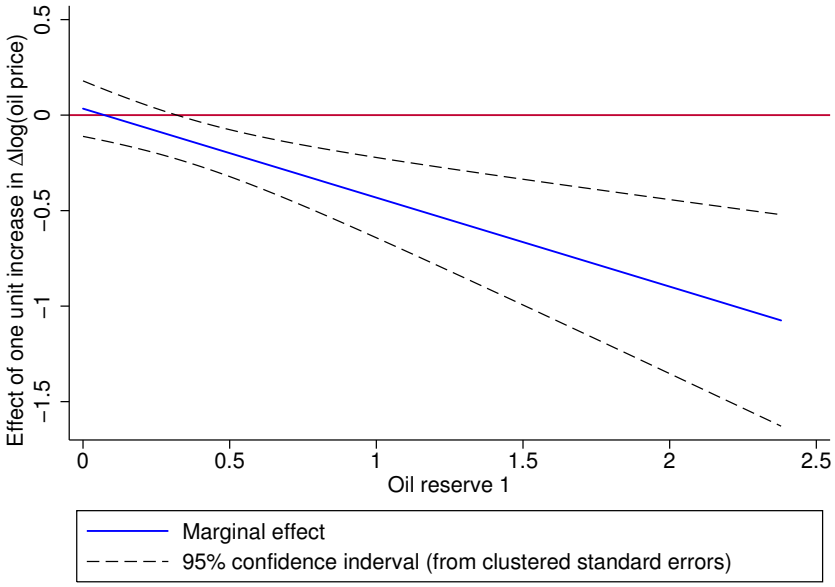
Appendix - Figures

Figure 3.5
Distribution of initial oil endowment (hundred of millions barrels) across countries



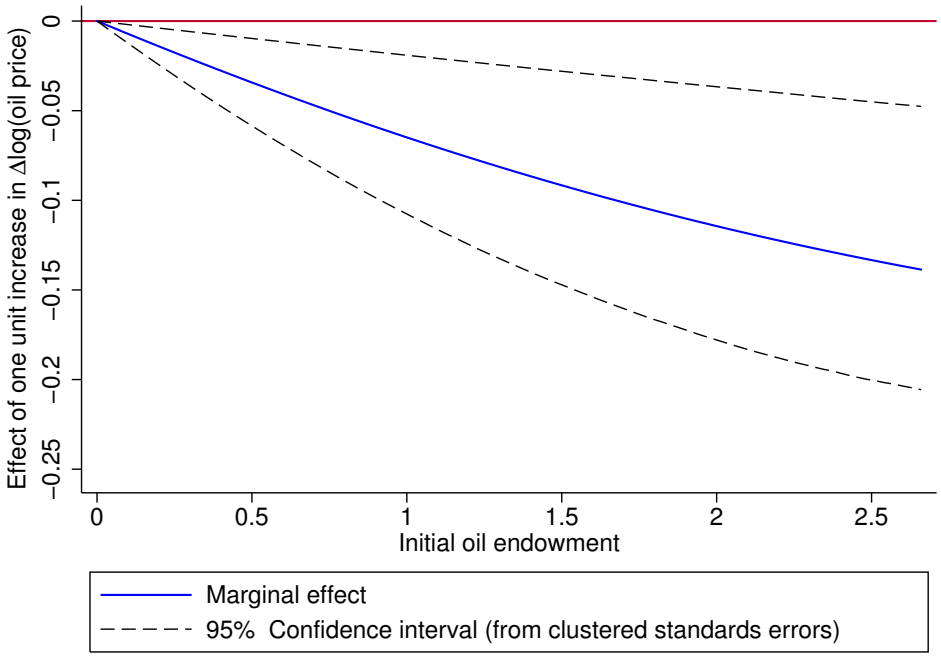
Notes : *Data source : Cotet and Tsui (2013), author's calculations.*

Figure 3.6
Oil shocks effect (Pooled OLS)



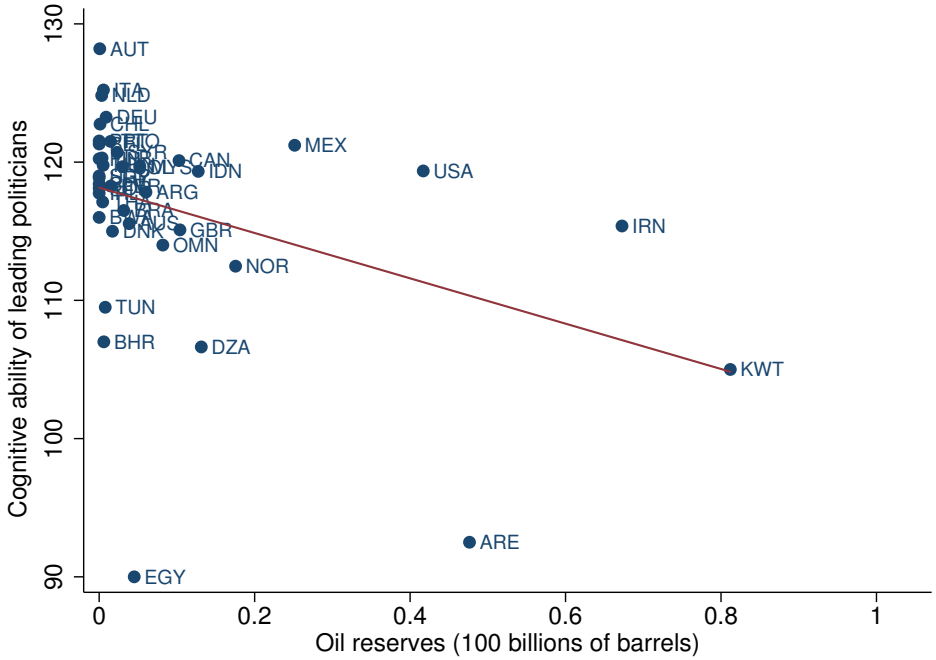
Notes : This figure shows the effects of a change of 1 unit (in log point) in oil prices on the $\Pr(\text{Graduate} = 1)$ for different levels of oil reserves (regression in Table 3.16 column 4).

Figure 3.7
Oil shocks effect (Pooled probit)



Notes : This figure shows the effects of a change of 1 unit (in log point) in oil prices on the Pr(Graduate $= 1$) for different levels of initial oil endowment (regression Table 3.16 column 3).

Figure 3.8
Correlation between the ability of leading politicians and oil wealth
(all countrires with data)



Notes : The data on the cognitive ability of leading politicians come from Rindermann *et al.* (2009). They provide IQ estimates of leading politicians defined as those who have the real decisive power (mostly presidents and heads of governments) over the period 1960-2009. This cross sectional data covers 90 countries that participate in student assessment studies. This figure shows the correlation for all the 40 countries for which I have data on the cognitive ability of politicians and data on oil wealth. The correlation between oil wealth and the cognitive ability of leading politicians is -0.398.

Appendix - Tables

Table 3.13
Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Graduate	713	0.292	0.455	0	1
College	713	0.763	0.426	0	1
Education index	713	5.822	1.412	2	8
Oil reserve	713	0.088	0.269	0	2.398
Mineral rents (% GDP)	512	0.671	1.916	0	13.027
Initial oil endowment	713	0.174	0.454	0	2.67
Δln(Oil Price)	713	0.014	0.255	-0.665	1.154
Δln(Nominal Oil Price)	713	0.05	0.27	-0.647	1.258
Δln(Mineral Price Index)	512	0	0.009	-0.058	0.072
Democracy	713	2.1	7.075	-10	10
GDP per capita (Log)	713	7.999	0.996	5.818	10.595
Elected	652	0.592	0.492	0	1
Regular Entry	713	0.797	0.403	0	1
Coup leader	647	0.144	0.351	0	1
Average year of education(over 15)	474	5.621	3.217	0.07	13.07
Average year of education(over 25)	497	4.114	3.077	0	12.281
Lawyers	706	0.229	0.421	0	1
military	706	0.252	0.435	0	1
Professors and Scientists	706	0.142	0.349	0	1
Ethnic fragmentation	658	0.419	0.266	0.01	0.959
Education distance	474	10.059	4.395	-6.756	19.61

Table 3.14
Regular entry, Election and the selection of a national leader with a Graduate level of education

Dependent variable : Graduate level of education	Regular entry						Elected leaders					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Oil reserve × Δln(Oil Price)	-0.316**	-0.262*	-0.341**	-0.327**	-0.345**	-0.366**	-0.450**	-0.501**	-0.471**	-0.516**	-0.483**	-0.507**
	(0.151)	(0.155)	(0.160)	(0.154)	(0.159)	(0.153)	(0.201)	(0.209)	(0.207)	(0.206)	(0.201)	(0.204)
Democracy			0.016***	0.022***	0.016***	0.022***			0.018***	0.014	0.017**	0.014
			(0.005)	(0.007)	(0.006)	(0.007)			(0.007)	(0.009)	(0.007)	(0.009)
GDP per capita (Log)					-0.016	-0.154					-0.101	-0.160
					(0.098)	(0.123)					(0.148)	(0.218)
Country specific trends	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	568	568	568	568	568	568	386	386	386	386	386	386
Countries	108	108	108	108	108	108	85	85	85	85	85	85

Notes : Columns (1)-(6) show the results for the subsample of national leaders who take power through regular channels as defined by Archigos. Columns (7)-(12) provide the results for the subsample of elected national leaders. All specifications include year dummies and country fixed effects. Clustered Standard errors at country level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3.15
Education over 15 and the selection of educated national leaders

Dependent variable : Graduate level of education	(1)	(2)	(3)	(4)	(5)	(6)
Oil reserve × Δln(Oil Price)	-0.362*	-0.491**	-0.477***	-0.540***	-0.474***	-0.511***
	(0.194)	(0.199)	(0.178)	(0.184)	(0.178)	(0.173)
Average year of education(over 15)	-0.014	0.130	-0.013	0.059	-0.018	0.067
	(0.049)	(0.110)	(0.046)	(0.107)	(0.048)	(0.102)
Democracy			0.024***	0.028***	0.024***	0.027***
			(0.006)	(0.007)	(0.006)	(0.007)
GDP per capita (Log)					0.024	-0.296*
					(0.118)	(0.152)
Country specific trends	No	Yes	No	Yes	No	Yes
Observations	474	474	474	474	474	474
Countries	55	55	55	55	55	55

Notes : Average year of education (over 15) is the average year of education of the population over 15 years old. All specifications include year dummies and country fixed effects. Clustered Standard errors at country level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3.16
Pooled estimators & the selection of educated national leaders

Dependent variable : Graduate level of education	Probit		OLS	
	(1)	(2)	(3)	(4)
Oil reserve $\times$ Δln(Oil Price)	-1.162**		-0.466***	
	(0.577)		(0.135)	
Oil reserve	-0.194**		-0.091**	
	(0.078)		(0.045)	
Oil initial endowment $\times$ Δln(Oil Price)		-0.524***		-0.383***
		(0.192)		(0.127)
Oil initial endowment $\times$ Δln(Oil Price)		-0.075*		-0.053*
		(0.038)		(0.029)
Δln(Oil Price)	0.051	0.051	0.034	0.042
	(0.075)	(0.075)	(0.074)	(0.076)
Democracy	0.018***	0.019***	0.018***	0.018***
	(0.003)	(0.003)	(0.003)	(0.003)
GDP per capita (Log)	0.035	0.032	0.039	0.038
	(0.024)	(0.025)	(0.024)	(0.025)
Constant	-1.614***	-1.550**	-0.047	-0.040
	(0.618)	(0.626)	(0.186)	(0.189)
Country specific trends	No	No	No	No
Observations	713	713	713	713
Countries	111	111	111	111

Notes : Clustered Standard errors at country level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3.17
Unconditional Logit and Probit with dummies estimates

Dependent variable : Graduate level of education	Probit			Logit		
	(1)	(2)	(3)	(4)	(5)	(6)
Oil reserve $\times$ Δln(Oil Price)	-1.226**	-1.153**	-1.128**	-1.163**	-1.125**	-1.094**
	(0.599)	(0.521)	(0.507)	(0.537)	(0.499)	(0.490)
Democracy		0.026***	0.025***		0.025***	0.025***
		(0.005)	(0.005)		(0.004)	(0.004)
GDP per capita (Log)			-0.046			-0.058
			(0.104)			(0.080)
Country specific trends	No	No	No	No	No	No
Observations	515	515	515	515	515	515
Countries	63	63	63	63	63	63

Notes : All specifications include year dummies and country fixed effects. Robust Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3.18
Asymmetric real Oil price shocks and the leadership curse

Dependent variable : College level of education	(1)	(2)	(3)	(4)	(5)	(6)
Oil reserve $\times$ Δ^+ln(Real Oil Price)	-0.560***	-0.845***	-0.609***	-0.879***	-0.608***	-0.861***
	(0.140)	(0.154)	(0.146)	(0.165)	(0.146)	(0.165)
Oil reserve $\times$ Δ^-ln(Real Oil Price)	0.444	0.638	0.507	0.702	0.508	0.475
	(0.562)	(0.538)	(0.545)	(0.507)	(0.547)	(0.592)
Democracy			0.008**	0.010**	0.008**	0.010**
			(0.004)	(0.004)	(0.004)	(0.004)
GDP per capita (Log)					0.004	-0.211
					(0.067)	(0.134)
Country specific trends	No	Yes	No	Yes	No	Yes
Observations	713	713	713	713	713	713
Countries	111	111	111	111	111	111

Notes : Δ^+ln(Real Oil Price) and Δ^-ln(Real Oil Price) are respectively the positive change and the negative change in the natural log of real oil prices. All specifications include year dummies and country fixed effects. Clustered Standard errors at country level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3.19
Ordered Probit and Logit

Dependent variable : Education index	Ordered Probit			Ordered Logit		
	(1)	(2)	(3)	(4)	(5)	(6)
Oil reserve $\times$ Δln(Oil Price)	-0.086	-0.137**	-0.125**	-0.060	-0.124***	-0.110**
	(0.065)	(0.054)	(0.055)	(0.053)	(0.047)	(0.047)
Oil reserve	-0.097***	-0.063***	-0.089***	-0.094***	-0.061***	-0.086***
	(0.023)	(0.020)	(0.022)	(0.021)	(0.019)	(0.020)
Δln(Oil Price)	0.014	0.004	-0.003	0.016	0.008	0.0009
	(0.025)	(0.023)	(0.023)	(0.022)	(0.020)	(0.021)
Democracy		0.008***	0.006***		0.008***	0.006***
		(0.001)	(0.001)		(0.001)	(0.001)
GDP per capita (Log)			0.023***			0.022***
			(0.007)			(0.007)
Country specific trends	No	No	No	No	No	No
Observations	713	713	713	713	713	713
Countries	111	111	111	111	111	111

Notes : The dependent variable is the education index comprising education categories 2 to 8. Columns (1)-(3) and columns (4)-(6) are respectively Ordered Probit and Ordered Logit Estimates. The marginal effects are computed for predicting the highest educational category. Robust Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3.20
Controlling for OPEC membership

Dependent variable : Graduate level of education	(1)	(2)	(3)	(4)	(5)	(6)
Oil reserve × Δln(Oil Price)	-0.303**	-0.422**	-0.359**	-0.451***	-0.357**	-0.489***
	(0.152)	(0.174)	(0.149)	(0.159)	(0.150)	(0.151)
OPEC	-0.101	-0.043	-0.138	-0.129	-0.139	-0.072
	(0.116)	(0.135)	(0.098)	(0.125)	(0.101)	(0.138)
Democracy			0.019***	0.022***	0.019***	0.022***
			(0.004)	(0.005)	(0.004)	(0.005)
GDP per capita (Log)					0.010	-0.274**
					(0.077)	(0.116)
Country specific trends	No	Yes	No	Yes	No	Yes
Observations	713	713	713	713	713	713
Countries	111	111	111	111	111	111

Notes : OPEC is a time-varying dummy variable that takes the value 1 when in a given year a country is a member of the Organization of the Petroleum Exporting Countries and 0 otherwise (the data are taken from Cotet and Tsui, 2013)). All specifications include year dummies and country fixed effects. Clustered Standard errors at country level in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3.21
Estimations on the post World War II : period (1950-2004)

Dependent variable : Graduate level of education	(1)	(2)	(3)	(4)	(5)	(6)
Oil reserve × Δln(Oil Price)	-0.383**	-0.485***	-0.418***	-0.508***	-0.410**	-0.553***
	(0.160)	(0.179)	(0.157)	(0.166)	(0.162)	(0.161)
Democracy			0.020***	0.021***	0.020***	0.020***
			(0.004)	(0.005)	(0.005)	(0.005)
GDP per capita (Log)					0.064	-0.388***
					(0.061)	(0.134)
Country specific trends	No	Yes	No	Yes	No	Yes
Observations	617	617	617	617	617	617
Countries	111	111	111	111	111	111

Notes : All specifications include year dummies and country fixed effects. Clustered Standard errors at country level in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3.22
Excluding 1973 and 1979 Oil shocks

Dependent variable : Graduate level of education	(1)	(2)	(3)	(4)	(5)	(6)
Oil reserve × Δln(Oil Price)	-0.314**	-0.398***	-0.355**	-0.409***	-0.353**	-0.472***
	(0.136)	(0.144)	(0.141)	(0.131)	(0.142)	(0.129)
Democracy			0.018***	0.022***	0.018***	0.021***
			(0.004)	(0.006)	(0.005)	(0.005)
GDP per capita (Log)					0.009	-0.270**
					(0.076)	(0.114)
Country specific trends	No	Yes	No	Yes	No	Yes
Observations	691	691	691	691	691	691
Countries	111	111	111	111	111	111

Notes : All specifications include year dummies and country fixed effects. Clustered Standard errors at country level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3.23
Baseline without the interaction term

Dependent variable : Graduate level of education	(1)	(2)	(3)	(4)
Democracy	0.018***	0.022***	0.018***	0.021***
	(0.004)	(0.005)	(0.004)	(0.005)
GDP per capita (Log)			0.010	-0.269**
			(0.075)	(0.109)
country specific trends	No	Yes	No	Yes
Observations	713	713	713	713
Countries	111	111	111	111

Notes : All specifications include year dummies and country fixed effects. Clustered Standard errors at country level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3.24
Oil shock and the educational distance between the leader and the population

Dependent variable : Educational distance	(1)	(2)	(3)	(4)	(5)	(6)
Oil reserve $\times$ Δln(Oil Price)	-2.284	-4.136**	-2.835*	-4.436**	-2.826*	-4.222**
	(1.716)	(1.832)	(1.649)	(1.750)	(1.654)	(1.658)
Democracy			0.113***	0.122***	0.114***	0.119***
			(0.038)	(0.030)	(0.038)	(0.030)
GDP per capita (Log)					0.117	-2.052*
					(0.891)	(1.168)
Country specific trends	No	Yes	No	Yes	No	Yes
Observations	474	474	474	474	474	474
Countries	55	55	55	55	55	55

Notes : Educational distance is the difference between the number of the years of education of the national leader and the average number of years of education of the population (the data are taken from Besley and Reynal-Querol, 2011). The results show in column (6) that for the average oil country in the sample the oil shocks over the period reduce the educational distance by 1.15 year relatively to non-oil countries. All specifications include year dummies and country fixed effects. Clustered Standard errors at country level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3.25
Oil shock and leaders education : Employing time-varying oil reserves

Dependent variable : Graduate level of education	(1)	(2)	(3)	(4)	(5)	(6)
Oil reserve $\times \Delta$ln(Oil Price)	-0.476**	-0.611***	-0.564***	-0.632***	-0.581***	-0.634***
	(0.203)	(0.234)	(0.188)	(0.209)	(0.181)	(0.208)
Oil reserve	0.141	-0.054	0.161	-0.187	0.236	-0.027
	(0.379)	(0.495)	(0.410)	(0.547)	(0.424)	(0.609)
Democracy			0.024***	0.024***	0.023***	0.024***
			(0.005)	(0.006)	(0.005)	(0.006)
GDP per capita (Log)					-0.100	-0.169
					(0.087)	(0.182)
Country specific trends	No	Yes	No	Yes	No	Yes
Observations	398	398	398	398	398	398
Countries	54	54	54	54	54	54

Notes : All specifications include year dummies and country fixed effects. The focus is on the subsample of oil countries. Clustered Standard errors at country level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3.26
Constitution and electoral rule : Classification of countries based on average

Dependent variable : Graduate level of education	Pdent		Parl		Prop	
	(1)	(2)	(3)	(4)	(5)	(6)
Oil reserve × Δln(Oil Price)	-0.209*	-0.210**	-0.706	-1.954	-0.411***	-0.352***
	(0.107)	(0.097)	(2.226)	(2.772)	(0.128)	(0.129)
Democracy	0.018***	0.017***	0.020*	0.030**	0.019***	0.024***
	(0.005)	(0.005)	(0.012)	(0.015)	(0.006)	(0.006)
GDP per capita (Log)	0.050	-0.337***	-0.024	-0.364	-0.058	-0.289**
	(0.136)	(0.128)	(0.173)	(0.428)	(0.124)	(0.132)
Country specific trends	No	Yes	No	Yes	No	Yes
Observations	433	433	204	204	472	472
Countries	65	65	24	24	55	55

Notes : Columns (1)-(2), (3)-(4) and (5)-(6) show respectively estimates for the subsample of countries under a presidential regime, a parliamentary regime and a proportional voting rule. Pdent = Presidential, Parl=Parliamentary and Prop=Proportional voting rule. All specifications include year dummies and country fixed effects. A country is classified as under a given institutional arrangement if it has been more than 50% of the period 1975-2004 under such institutional arrangement. Clustered Standard errors at country level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3.27
Leadership curse (oil price choc) - Estimations over the period (1960-2004)

Dependent variable : Graduate level of education	(1)	(2)	(3)	(4)	(5)	(6)
Oil reserve × Δln(Oil Price)	-0.460***	-0.402***	-0.476***	-0.402***	-0.474***	-0.439***
	(0.158)	(0.140)	(0.160)	(0.137)	(0.166)	(0.126)
Democracy			0.022***	0.023***	0.022***	0.022***
			(0.005)	(0.006)	(0.005)	(0.006)
GDP per capita (Log)					0.079	-0.240
					(0.076)	(0.159)
Country specific trends	No	Yes	No	Yes	No	Yes
Observations	538	538	538	538	538	538
Countries	111	111	111	111	111	111

Notes : All specifications include year dummies and country fixed effects. Clustered Standard errors at country level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3.28
Leadership curse - Mineral wealth (countries with positive rents)

Dependent variable : Graduate level of education	(1)	(2)	(3)	(4)	(5)	(6)
Mineral rents (% GDP) × Δln(Mineral Price Index)	-0.070	-0.849***	-0.186	-0.818***	-0.227	-0.768**
	(0.458)	(0.311)	(0.440)	(0.297)	(0.430)	(0.302)
Δln(Mineral Price Index)	-0.350	2.494	1.295	3.676*	1.442	3.560*
	(2.499)	(2.247)	(2.573)	(2.098)	(2.492)	(2.105)
Democracy			0.023***	0.025***	0.024***	0.025***
			(0.006)	(0.007)	(0.006)	(0.007)
GDP per capita (Log)					0.049	-0.299
					(0.100)	(0.184)
Country specific trends	No	Yes	No	Yes	No	Yes
Observations	450	450	450	450	450	450
Countries	87	87	87	87	87	87

Notes : All specifications include year dummies and country fixed effects. The focus is on the subsample countries with positive mineral rents. Minerals included are bauxite, copper, gold, iron, lead, nickel, phosphate, silver, tin and zinc. Clustered Standard errors at country level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

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CONCLUSION GÉNÉRALE

Cette thèse a analysé les conséquences de l'accumulation des rentes tirées des ressources naturelles dans les pays en développement avec un accent particulier sur les finances publiques et l'économie politique. En premier lieu, deux aspects des finances publiques (les recettes fiscales et les dépenses publiques) sont étudiés. Enfin, en ce qui concerne l'angle d'économie politique, l'analyse porte sur l'influence de ces rentes sur la sélection des leaders politiques nationaux.

La collecte des recettes fiscales est cruciale pour le développement économique. L'effondrement récent des prix du pétrole (de juin 2014 à fin février 2016) et son effet néfaste sur les recettes publiques dans certains pays qui sont dépendants du pétrole renforcent l'importance de la collecte des recettes fiscales. Le premier chapitre a ainsi analysé le rôle de la fiscalité progressive dans l'augmentation de la collecte des recettes fiscales dans les pays en développement riches en ressources naturelles. Nous avons incorporé un impôt progressif sur le revenu dans un cadre théorique où un gouvernement d'un pays riche en ressources naturelles fait face au problème d'incitation qui est celui d'investir dans sa propre capacité de percevoir des recettes fiscales. Le modèle prédit qu'un pays riche en ressources disposant d'un impôt progressif sur le revenu a plus d'incitations à investir dans sa capacité fiscale. Le mécanisme est que le système fiscal progressif permet au gouvernement de percevoir plus de taxes (sur les hauts revenus) en période de boom. En outre, nous avons estimé l'impact causal des retombées des rentes de ressources naturelles sur la collecte des recettes fiscales. Les résultats montrent que, conformément au modèle théorique, cet effet dépend du degré de progressivité de la fiscalité. L'évaluation empirique de l'effet des ressources naturelles sur les recettes fiscales est difficile en raison de l'endogénéité potentielle des rentes de ressources naturelles. La stratégie empirique de ce chapitre exploite la variation exogène plausible des prix internationaux des

ressources naturelles au niveau national afin d'isoler l'impact causal des rentes de ressources naturelles sur les recettes fiscales intérieures. Nous avons utilisé un ensemble de données de panel macroéconomiques couvrant 57 pays en développement sur la période 1981-2005. Nous trouvons qu'il y a une substitution partielle de 25 % entre les rentes des ressources naturelles et les recettes fiscales intérieures. Cependant, l'imposition progressive atténue l'effet préjudiciable des ressources naturelles sur les recettes fiscales intérieures. A un niveau de progressivité équivalant à deux fois la moyenne de l'échantillon, une augmentation des rentes de 1 $ réduit les recettes fiscales intérieures de seulement 0,14 $. Ces résultats suggèrent que les réformes de politiques publiques visant à renforcer la fiscalité progressive peuvent aider les pays riches en ressources naturelles à renforcer leur capacité fiscale. Le modèle théorique suggère que le changement d'incitation des gouvernements est un canal potentiel à travers lequel la taxation progressive peut opérer pour amortir ladite «malédiction des revenus». Cependant, d'autres canaux potentiels (la morale fiscale et les stabilisateurs automatiques) peuvent également être à l'œuvre. Alors qu'il y a une recherche croissante sur l'effet des ressources naturelles sur la capacité fiscale, ce chapitre, à notre connaissance, est le premier à montrer que l'imposition progressive atténue la «malédiction des revenus». À l'inverse de l'idée traditionnelle que la fiscalité progressive peut avoir un impact économique négatif, ce chapitre suggère qu'elle peut aussi avoir des effets positifs. En plus d'un modèle théorique, le chapitre utilise une nouvelle variable instrumentale pour traiter l'endogénéité des rentes de ressources naturelles. Le chapitre suggère une voie de recherches futures sur la manière dont la conception de la politique fiscale peut influencer la capacité fiscale .

Dans le second chapitre de notre thèse, l'analyse est centrée sur le côté des dépenses publiques comme précédemment mentionné. Un des objectifs poursuivis ici en lien avec le chapitre 1 est d'analyser l'implication des ressources naturelles pour les dépenses publiques, en particulier en période électorale ainsi que le rôle potentiel des institutions budgétaires. Afin d'examiner empiriquement si la contrainte que les règles budgétaires peuvent imposer à la politique budgétaire discrétionnaire est

contraignante pendant les années d'élection, ce chapitre exploite la structure géographique dans l'adoption des règles budgétaires. En utilisant un échantillon de pays en développement, les résultats montrent que les règles budgétaires sont importantes pour la discipline budgétaire. Par ailleurs, certaines caractéristiques spécifiques des règles budgétaires sont particulièrement pertinentes pour parvenir à une discipline budgétaire. Les règles de dépenses, les règles visant le gouvernement général et les règles contrôlées par un organisme indépendant du gouvernement mènent à une discipline budgétaire tout au long du cycle électoral. En outre, nous constatons également que les règles budgétaires sont plus efficaces pour limiter les cycles politico-budgétaires selon leur longévité. Ceci suggère que les clauses échappatoires devraient être bien définies afin d'éviter de modifier ou de modifier trop souvent les règles budgétaires et de compromettre ainsi leur crédibilité à long terme. Quant à ce qui concerne l'aspect de la « malédiction des ressources naturelles », bien que nous constations que le cycle politico-budgétaire est particulièrement fort dans les pays riches en ressources, nous n'avons pas trouvé de preuves solides sur le rôle des règles budgétaires à cet égard. Notons également que les résultats restent robustes à une stratégie d'identification augmentée par un instrument supplémentaire qui s'appuie sur la persistence du processus budgétaire. Ces résultats ont des implications intéressantes sur la conception des règles budgétaires dans les pays en développement. Notamment, les règles budgétaires devraient cibler les administrations publiques générales. Des études antérieures soulignent que les cycles politico-budgétaires sont un symptôme de la divergence entre les incitations politiques et la maximisation du bien-être social et que l'utilisation agressive de la discrétion de la politique budgétaire induit de la volatilité macroéconomique (Fatás *et al.* 2003). Les règles budgétaires peuvent donc jouer un rôle important dans la réduction de la volatilité macroéconomique en limitant les dépenses publiques motivées par les considérations politiques.

Le chapitre 2 fait ainsi le pont entre le chapitre 1 et le chapitre 3. Les deux premiers chapitres soulignent la manifestation de la « malédiction des ressources naturelles » dans le contexte particulier des finances publiques, notamment en matière d'effort

fiscal et de dépenses publiques en période électorale. Le Chapitre 3 ajoute ainsi aux fondements politiques de la « malédiction des ressources naturelles » en montrant que les ressources naturelles affectent le type d'individus qui arrivent au pouvoir. Il est important d'analyser l'effet des ressources naturelles sur la sélection politique, car une grande partie de la recherche sur les fondements politiques de la « malédiction des ressources naturelles » porte sur la façon dont ces ressources influent sur le comportement du leader une fois au pouvoir. En outre, il existe une forte preuve empirique que le type de politicien au pouvoir affecte les choix politiques. Ce chapitre comble cette lacune dans la littérature en soulignant que, précisément, les ressources naturelles peuvent affecter le type de leader qui arrive au pouvoir et qui décidera ensuite des choix de politiques publiques. En utilisant une base de données de panel sur plus de 700 leaders de 111 pays au cours de la période 1930-2004, le chapitre 3 analyse si une croissance des prix des ressources naturelles, en particulier un choc positif des prix du pétrole, réduit les chances de sélectionner des leaders hautement qualifiés. La stratégie empirique exploite une approche de différence en différences. Ainsi, nous explorons si les chocs positifs du prix du pétrole ont un effet disproportionné sur la probabilité de choisir un leader national ayant un niveau d'éducation élevé dans les pays riches en pétrole. Les résultats montrent que la hausse historique des prix du pétrole observée sur la période a contribué à une réduction comprise entre 11,80 % et 20,79 % sur la probabilité de sélectionner un leader national ayant un niveau d'éducation supérieur, pour le pays pétrolier moyen. Ainsi, les résultats suggèrent que les chocs pétroliers positifs peuvent accroître la survenance de la « malédiction des ressources naturelles » en réduisant les chances d'avoir un leader national compétent ayant la capacité (attendue) de faire les meilleurs choix de politiques publiques une fois au pouvoir. Une implication pour les chapitres précédents est que le manque d'effort fiscal ainsi que la mauvaise allocation des dépenses publiques en période électorale pourraient être le reflet d'un manque de compétence. Une analyse approfondie, montre que le résultat provient des pays en développement caractérisés par une forte fragmentation ethnique. Un cadre théorique est alors proposé pour éclairer cette dernière conclusion. Le modèle présente l'interaction entre un potentiel leader national et une coalition de chefs

ethniques. La coalition offre un soutien électoral à un candidat en échange de futures faveurs une fois que ce dernier prendra ses fonctions. Aussi, afin de garantir que le nouveau leader respecte l'accord, la coalition spécifie une menace de coups d'État ou de révolution. Un choc positif sur les prix du pétrole rend crédible cette menace (qui s'apparente à une taxe sur les revenus tirés du pouvoir). Cette situation décourage donc la candidature de citoyens très éduqués qui préfèrent rester dans le secteur privé. La faisabilité du clientélisme dans des environnements ethniquement fragmentés est donc susceptible d'induire un piège de « qualité » du leadership : seuls les candidats de faible « qualité » sont incités à se présenter aux élections, ce qui peut à son tour décourager la candidature des citoyens de haute « qualité ». Alors qu'il y a une recherche croissante sur les déterminants de la sélection politique et les fondements politiques de la «malédiction des ressources naturelles », il s'agit à notre connaissance du premier travail de recherche à montrer que les chocs pétroliers positifs réduisent les chances de choisir un leader national avec un haut niveau d'éducation. Cependant, il est clair que le présent document n'est qu'une première étape et qu'il reste beaucoup à faire pour comprendre les fondements politiques de la « malédiction des ressources naturelles ». Les résultats suggèrent que les fondements politiques de la malédiction des ressources ont probablement une partie de leur racine dans la qualité des leaders sélectionnés. En effet nous trouvons aussi un résultat similaire pour la richesse minérale (mais moins robuste). Ceci est particulièrement pertinent parce que la volatilité dans les pays riches en ressources naturelles rend difficile pour les électeurs de discerner entre la compétence d'un politicien (au pouvoir) et la chance. En d'autres termes, il est bien connu que le contrôle électoral est difficile dans les pays riches en ressources naturelles. En outre, il est également bien connu que les dirigeants ont tendance à demeurer longtemps au pouvoir dans les pays riches en ressources naturelles et que, par conséquent, la qualité de la sélection politique est cruciale pour le développement économique.

À cet égard, la littérature dans son état actuel se concentre uniquement sur les effets des ressources naturelles sur les incitations des politiciens une fois au pouvoir. Toutefois, si les personnes qui sont choisies pour une fonction publique ne sont pas compétentes, il est probable que leur performance soit médiocre.

Plusieurs questions de recherche relatives à la « malédiction des ressources naturelles » ont fait l'objet d'une analyse approfondie au travers des trois chapitres de cette thèse. Au chapitre 1, les questions de recherche suivantes ont été examinées. Est-ce que l'abondance en ressources naturelles cause moins d'effort de mobilisation de recettes fiscales dans les PED? Si oui, est-ce que la progressivité du système de taxation peut jouer un rôle? Quant au chapitre 2, les questions de recherche ayant fait l'objet d'études sont : est-ce que les institutions budgétaires telles que les règles budgétaires permettent en général d'atténuer les comportements opportunistes des politiciens en période électorale en ce qui concerne les dépenses publiques dans les PED? Ensuite, comment est-ce que d'une part les ressources naturelles affectent ces cycles électoraux et d'autre part y-a-t-il un rôle pour ces règles budgétaires dans cet environnement particulier? Enfin, le chapitre 3 est consacré à la question suivante : est-ce que les chocs positifs de revenus tirés du pétrole favorisent l'arrivée au pouvoir de leaders moins éduqués (ou moins compétents)?

Les trois chapitres de cette thèse ont fourni des éléments de réponse à chacune des précédentes questions en lien avec la « malédiction des ressources naturelles ». Le chapitre 1 fournit des résultats empiriques robustes sur l'effet causal des revenus tirés des ressources naturelles sur l'effort de mobilisation de recettes fiscales dans les PED. En dépit de cet effet négatif des rentes tirées des ressources naturelles, le chapitre 1 a démontré que ceci n'est pas une fatalité. En effet, la progressivité du système de taxation permet d'atténuer ce problème. Quant au chapitre 2, il y est démontré d'une part que les cycles électoraux sont particulièrement importants dans les pays riches en ressources naturelles. D'autre part, malgré l'effet de discipline induit par les règles budgétaires en général, nous n'avons pas trouvé de preuve solide de leur efficacité dans le contexte particulier d'un environnement dominé par les

ressources naturelles. Enfin, le chapitre 3 a contribué aux fondements politiques de la « malédiction des ressources naturelles ». Une analyse empirique approfondie a révélé que les chocs positifs de revenus tirés du pétrole réduisent les chances d'élire un leader éduqué. L'exploration empirique des mécanismes sous-jacents a été complétée par une analyse théorique.

Chaque chapitre de cette thèse a apporté des contributions importantes telles que discutées précédemment dans l'Introduction. Toutefois, à l'instar des autres travaux dans la littérature reliée, cette thèse est loin d'avoir fourni un traitement exhaustif de la question de la « malédiction des ressources naturelles ». La thèse ouvre des opportunités pour des recherches futures. En ce qui concerne le chapitre 1, l'on pourrait étendre l'analyse à la progressivité du système de taxation dans sa globalité à condition d'avoir les données. De plus, on pourrait également imaginer un cadre théorique plus général permettant d'incorporer l'offre de travail des individus. Il serait intéressant d'étendre ce chapitre dans les travaux de recherche futurs dans ces directions.

L'investigation empirique du chapitre 2 pourrait également faire l'objet de futurs travaux. En particulier, les résultats ne rejettent pas l'hypothèse selon laquelle les règles budgétaires seraient inefficaces pour contraindre les cycles électoraux dans les pays riches en ressoruces naturelles. Dans notre échantillon, nous avons peu de pays riches en ressources naturelles disposant de règles budgétaires. Notre résultat sur l'inefficacité des règles budgétaires pourrait alors y être lié. D'une part, des analyses futures incorporant un sous-échantillon plus large de ces pays sont envisageables. D'autre part, l'on pourrait également explorer les déterminants de l'adoption des règles budgétaires dans le contexte particulier des pays riches en ressources naturelles.

Enfin, l'analyse empirique du chapitre 3 quoique donnant lieu à des contributions significatives, pourrait aussi faire l'objet de rafinements dans de futurs travaux de recherche. Premièrement, il serait intéressant de pouvoir analyser dans un cadre unifié les forces de la sélection adverse (étudiées dans ce chapitre) ainsi que les

forces de l'aléa moral (qui ont fait l'objet d'étude dans la littérature antérieure). Deuxièmement, des informations additionnelles sur les leaders (par exemple les domaines d'études) ainsi que des données sur la composition du pool de candidats à l'élection pourraient permettre d'enrichir les analyses futures. L'utilisation de données granulaires à l'échelle d'un pays (par exemple l'Indonésie ou le Brésil) apparait comme une approche à fort potentiel pour des recherches futures sur la malédiction du leadership.